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PREFACE

This fifteenth issue of *NAFO Scientific Council Reports* containing reports of Scientific Council Meetings held in 1994 is compiled in four sections: **Part A** – Report of Special Scientific Council Meeting during 13-15 February 1994, which updated the June 1993 stock assessment of Cod in Div. 3NO, **Part B** – Report of the Scientific Council Meeting during 8-22 June 1994 which addressed the annual requests for scientific advice on fisheries management, **Part C** – Report of the Annual Meeting during 19-23 September 1994. The report of the Special Session on "Impact of Anomalous Oceanographic Conditions at the Beginning of the 1990s in the Northwest Atlantic on the Distribution and Behaviour of Marine Life" which was held during 15-16 September 1994, is included in the report of the Annual Meeting, and **Part D** – Report of the Scientific Council Meeting during 18-21 November 1994 which conducted assessments on shrimp in Subareas 0 and 1, and Denmark Strait. **Part E** of this volume contains the Agenda, Lists of Research and Summary Documents, Lists of Participants, and List of Recommendations relevant to Part A, B, C and D.

The *NAFO Scientific Council Reports* series replaced *ICNAF Redbook* series which terminated with the last issue in 1979. The first issue of this series was published in December 1980.

January 1995

Tissa Amaratunga
Assistant Executive Secretary

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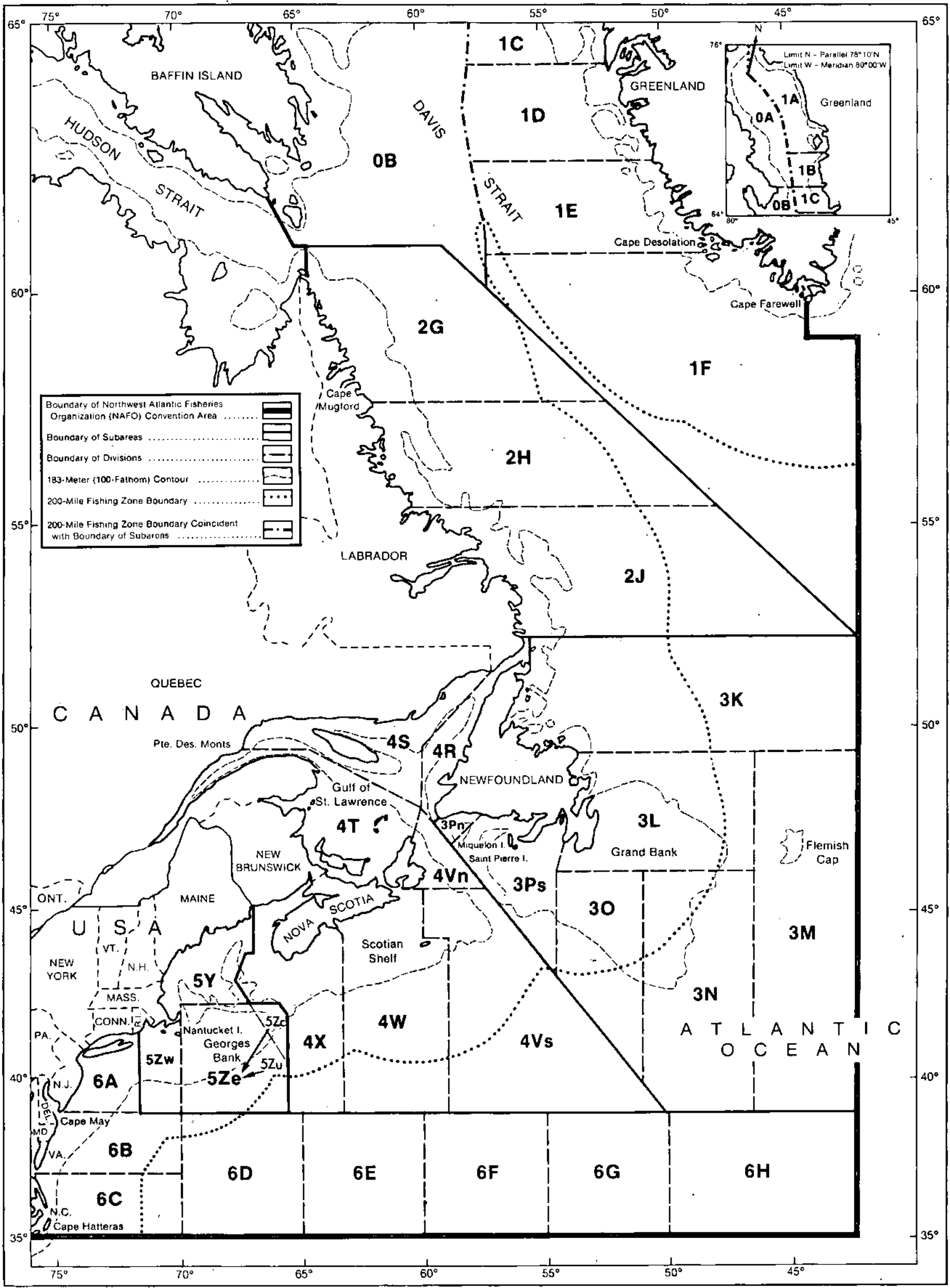

PART A

Scientific Council Special Meeting, 13-15 February 1994

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REPORT OF SCIENTIFIC COUNCIL

Special Meeting, 13-15 February 1994

Chairman: H. Lassen Rapporteur: T. Amaratunga

I. PLENARY SESSIONS

The Scientific Council met at the European Union DG XIV Building, at 99 Rue Joseph II, Brussels, Belgium, on 13 February 1994, and at the Albert Borschette Conference Centre on 14 and 15 February 1994.

Representatives attended from Canada, European Union (Denmark, Germany, Portugal, Spain and United Kingdom), Japan, Republic of Korea and the Russian Federation. The Executive Secretary and Assistant Executive Secretary were in attendance.

The opening session of the Council was called to order at 0915 hr on 13 February 1994.

The Chairman extended a special welcome to the representatives of the Republic of Korea, from the new Contracting Party of NAFO, to this their first meeting of the Scientific Council.

The Chairman welcomed everyone to this special meeting to conduct an updated stock assessment of cod in Div. 3NO and to provide catch options for 1994. The Assistant Executive Secretary was appointed rapporteur.

The plan of work was reviewed. With respect to the Fisheries Commission provisional agenda for the 15-17 February 1994 Meeting, the Council noted that there were no new data available since the Scientific Council meeting of 19-23 November 1993, to reconsider items on the experimental redfish fishery or the minimum fish size for witch flounder, redfish and Greenland halibut. The provisional agenda of this Scientific Council Meeting (see Agenda I, Part E, this volume) was accordingly **adopted** as presented, and the scientific considerations of the assessment of cod in Div. 3NO was assigned to the Standing Committee on Fishery Science (STACFIS). The session was adjourned at 0935 hr.

At a brief meeting on 14 February 1994, the Council agreed to convene its closing session on 15 February 1994.

The concluding session of the Council was convened at 0900 hr on 15 February 1994. The Council then considered the report of the Standing Committee on Fishery Science, and **adopted** it with the proposed modifications.

The Council then considered and **adopted** the Report of the Scientific Council of the 13-15 February 1994 Meeting.

The meeting was adjourned at 1130 hr on 15 February 1994.

The Report of the Standing Committee on Fishery Science (STACFIS) is at Appendix I.

Brief summaries of the STACFIS Report and other matters considered by the Council are given below in Sections II-IV. The Agenda, List of Research (SCR) and Summary (SCS) Documents, and the List of Participants of this meeting are given Part E, this volume.

II. FISHERY SCIENCE (see STACFIS report, App. I)

1. **Stock Assessment**

a) **Cod in Divisions 3N and 3O**

The Council noted that the assessment of cod in Div. 3NO as requested by Canada was completed by STACFIS, and endorsed the assessment as presented in the STACFIS report. The Summary Sheet as prepared for the assessment is given below.

SUMMARY SHEET – Cod in Divisions 3N and 3O

Source of Information: SCR Doc. 94/1, 2, 3

Year	1986	1987	1988	1989	1990	1991	1992	1993	1994
Recommended TAC				Same as agreed					
Agreed TAC	33	33	40	25	18.6	13.6	13.6	10.2	6
Reported catches	51	42	43	33	18	17[1]	10.1[1]	9[1]	
Non-reported catches	-	-	-	-	11	12	2.5	0.7	
Total landings	51	42	43	33	29	29[1]	12.6[1]	9.7[1]	
Sp. stock biomass from maturity ogive									
Dome	240	240	170	140	120	110	90	60	
Flat-topped	105	104	81	63	51	43	29	20	
Recruitment (age 3)									
Dome	8	7	15	16	7	10	57	40	
Flat-topped	9	7	14	14	6	8	47	33	
Mean F (ages 7-10)									
Dome	0.16	0.17	0.22	0.19	0.18	0.29	0.13	0.09	
Flat-topped	0.32	0.37	0.46	0.37	0.37	0.64	0.31	0.19	

[1] Provisional.

Weights in '000 tons

Catches: Catches declined from a peak of 227 000 tons in 1967 to lows of 12 600 tons in 1992 and 9 728 tons in 1993. TACs were introduced for this stock in 1973. Until 1978 catches were substantially lower than TACs. From 1981 to 1991, catches exceeded the TACs. However, in 1992 and 1993 catches were slightly below the TACs.

Data and Assessment: An analytical assessment was conducted using three Canadian survey indices and one Russian survey index in a formulation of the adaptive framework. Analyses were conducted using two estimates of partial recruitment (PR), domed and flat topped. The resulting interpretations of stock status and stock trends over time were substantially different but STACFIS considered that the analysis and data were not sufficient to determine the most appropriate PR. It was noted, however, that the analysis using the domed PR indicated that the SSB in the mid-1980s was far greater than that during the 1960s. This was considered to be unrealistic.

Fishing Mortality: For both options of PR, the mean fishing mortalities were high in the 1960s and early-1970s, and during some years were in excess of 1.0. They decreased in the late-1970s to levels at or below $F_{0.1}$. Since the early-1980s, Fs gradually increased but declined in 1992 and 1993. Fishing mortalities in recent years have been particularly high on the younger immature ages.

Recruitment: The 1983 to 1988 year-classes were extremely weak. The 1989 and possibly the 1990 year-classes were, however, above the average of the 1974-88 year-classes.

State of Stock: The stock is comprised mainly of young, immature fish. The number of older, mature fish continues to decline. Rebuilding of the spawning stock biomass (SSB) in the short term is dependant on the 1989 and the 1990 year-classes surviving to maturity. It will be another one to two years before the majority of these fish are sexually mature.

Forecast for 1994:

Option Basis	Predicted Catch (1994) (tons)		Predicted SSB (1.1.1995) (tons)
		Domed PR	
$F_{0.1}$ = 0.25	18 871		61 649
F_{max} = 0.40	28 622		55 486
No Fishing	0		72 747
F_{94} = 0.07	6 000		69 878
		Flat-topped PR	
$F_{0.1}$ = 0.20	10 609		37 709
F_{max} = 0.30	15 336		34 663
No Fishing	0		44 644
F_{94} = 0.11	6 000		40 767

Recommendation: Exploitation rates targeting on younger immature fish remain high. STACFIS therefore reiterated its advice of June 1993 that all necessary steps should be taken to eliminate the catch of small fish from this stock.

The 1989 year-class is estimated to be somewhat stronger than estimated in June 1993. There are indications that the 1990 year-class is also strong. However, high variability in the 1993 Canadian and Russian spring RV survey data, as well as conflicting evidence between spring and autumn surveys, dictate caution in the interpretation of the strength of these year-classes. Therefore STACFIS also reiterated its June 1993 advice that any catch in 1994 should not exceed 6 000 tons. STACFIS emphasized that this catch level is an upper limit and should not be interpreted as a recommended TAC.

The SSB continued to decline in 1993. STACFIS advised that the stock should be allowed to rebuild.

Special Comments: The SSB cannot begin to recover unless the 1989 and 1990 year-classes survive to maturity. This will not happen if fisheries on immature ages continue at current high levels. Any harvesting of this stock will reduce the rebuilding potential. Recovery will occur most rapidly in the absence of a fishery.

III. ADOPTION OF REPORTS

At its concluding session on 15 February 1994, the Council reviewed and **adopted** the Report of the Standing Committee on Fishery Science and the Report of the 13-15 February 1994 Meeting of the Scientific Council, noting that discussions of the Council's concluding session and editorial modifications will be reflected in the Report.

IV. ADJOURNMENT

There being no other business, the Chairman extended a special thanks to the Executive Secretary, the Assistant Executive Secretary and to the staff of the Secretariat for exceptional efficiency and support. Thanks were extended to all participants for their valuable contributions. He adjourned the meeting, looking forward to seeing most of the participants at the June Meeting.

APPENDIX I. REPORT OF STANDING COMMITTEE ON FISHERY SCIENCE (STACFIS)

Chairman: H. P. Cornus Rapporteur: Various

The Committee met at the European Union DG XIV Building, at 99 Rue Joseph II, Brussels, Belgium on 13 February 1994, and at Albert Borschette Conference Centre on 14 February 1994, to consider and report on the assessment of cod in Div. 3NO as referred to it by the Scientific Council. Representatives attended from Canada, European Union (EU) (Denmark, Germany, Portugal, Spain and United Kingdom), Japan, Republic of Korea and the Russian Federation.

The Chairman was pleased to note the attendance of representatives from the Republic of Korea, and extended a cordial welcome to them, while welcoming all representatives to this meeting.

During its meeting on 14 February 1994, the Committee noted that the Chairman, H. P. Cornus (EU-Germany) would be leaving before the completion of STACFIS deliberations. The Committee agreed that the Scientific Council Chairman, H. Lassen (EU-Denmark), would chair the meeting to its completion.

I. STOCK ASSESSMENTS

1. **Cod in Divisions 3N and 3O** (SCR Doc. 94/1, 2, 3)

a) **Introduction**

i) **Description of fishery**

Nominal catches increased during the late-1950s and early-1960s, reaching a peak of about 227 000 tons in 1967, and subsequently declined to lows of 12 561 tons in 1992 and 9 728 tons in 1993 (Fig. 1).

Recent TACs and catches ('000 tons) are as follows:

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
TAC	26	33	33	33	40	25	18.6	13.6	13.6	10.2	6
Catch	27	37	51	42	43	33	29[1]	29[1,2]	13[2]	10[2]	

[1] Includes estimates of non-reported catches.
[2] Provisional.

TACs were first introduced for this stock in 1973 at a level of 103 000 tons. Until 1978, catches were substantially lower than the TACs but from 1981 to 1991, they exceeded those recommended. In 1992 and 1993, the catches were slightly under the recommended TAC.

For the period since 1978, catches have been taken predominantly by Canada and EU-Spain. All non-Canadian catches in 1993 were from the Regulatory Area. Canadian catches have been taken mainly within the Canadian 200-mile fishery zone by otter-trawlers, with an increasing proportion of other gears, especially gillnet and longline. Canadian catches were stable at approximately 19 000 tons from 1985 to 1988, but have since declined to about 5 300 tons in 1993.

Catches by EU-Spain, mainly by pair-trawlers, averaged approximately 17 000 tons from 1986 to 1989. Since 1989, catches have decreased to a low of approximately 1 900 tons in 1992 but rose in 1993 to approximately 3 000 tons. Catches by EU-Portugal decreased from about 7 000 tons in 1986 to 1 000 tons in 1989, but increased again to 2 000 tons in 1990 but dropped to 450 tons in 1992. The reported catch in 1993 was about 525 tons. The latter was taken by gillnet and otter-trawl fleets.

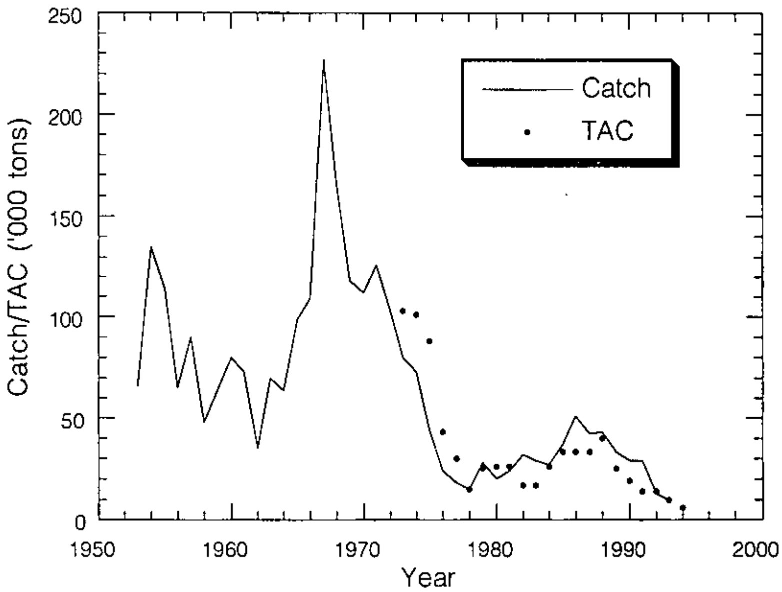


Fig. 1. Cod in Div. 3NO: catches and TACs.

In recent years additional unreported catches have been estimated for countries fishing in the Regulatory Area, and in 1993 this amounted to about 700 tons.

b) **Input Data**

i) **Commercial fishery data**

Catch rates. Catch-rate indices for Canadian otter-trawl and Spanish pair-trawl fleets have not been incorporated in the assessment calibration models in recent years because they were not considered reflective of stock abundance. They were only considered useful as indicators of general trends. Otter-trawl catch rates for EU-Portugal were up in 1993 after having been low during the 1990-92 period. Gillnet catch rates were higher in 1991-92, down in 1989-90 and declined in 1993. It was difficult to determine if these changes were different from previous years due to the associated high standard errors. Pair-trawl catch rates for EU-Spain were higher in 1993 in comparison to 1991 and earlier years. In 1992 data were not available.

Catch-at-age. Biological sampling data from the Canadian otter-trawl, longline and gillnet fisheries and Spanish pair-trawl fisheries were used to estimate the age composition of the commercial catch in 1993. The 1988 and 1989 year-classes (ages 4 and 5) were most numerous in the Canadian catch and landings. The 1989 and 1990 year-classes (age 4 and 3) were the most abundant in the pair-trawl fishery of EU-Spain in 1993. Sampling data from the Spanish fleet were used to derive age compositions for all cod catches in the Regulatory Area. Sampling data from the Canadian gillnet fishery were used to estimate catch-at-age for the Portuguese gillnet fishery. This indicated that about 3.7 million age 3 and 4 cod were caught in 1993.

There did not appear to be any discernable trends in mean weights-at-age, although those for most ages had shown an increase from 1992 to 1993.

ii) **Research survey data**

Stratified-random research vessel surveys have been conducted by Canada in Div. 3N for the 1971-93 period, with the exception of 1983, and in Div. 3O for the years 1973-93 with the exception of 1974 and 1983. Biomass for Div. 3N and 3O combined, gradually increased from the early-1970s to the early-1980s and increased considerably between 1982 and 1984 (Fig. 2). Another sharp increase occurred in 1987 but survey biomass then declined until 1992 when it was the lowest observed since 1982. Estimates of the Div. 3NO biomass in 1993 increased to about 74 000 tons.

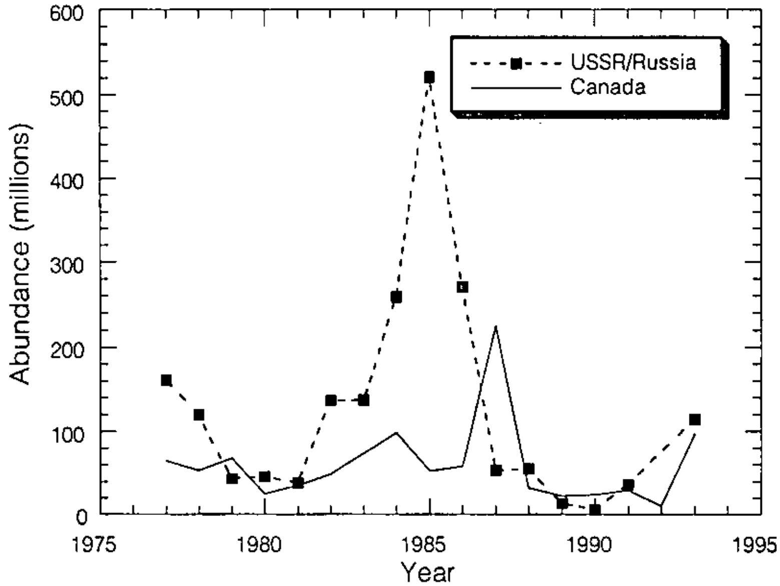


Fig. 2. Cod in Div. 3NO: abundance estimates from Canadian and USSR/Russian spring research vessel survey data.

Abundance estimates for Div. 3NO suggested similar trends to those observed for biomass with a large value occurring in 1987 resulting mainly from a high estimate for Div. 3O. The abundance estimates for the 1988-91 period were low but stable. The 1992 estimate dropped and was the lowest observed in the time series. The 1993 estimate was considerably higher, reflecting the strength of the 1989 and 1990 year-classes.

The low levels of biomass and abundance in recent years had been attributed to a succession of very weak year-classes as measured at age 3. Abundance estimates-at-age indicated that the 1983 to 1988 year-classes (ages 5 to 10 in 1993) were among the lowest observed in the time series. The dominant age in the 1993 survey was 3 and 4 (the 1990 and 1989 year-classes) which comprised about 90% of the total abundance.

As in 1991 and 1992, the 1993 spring survey also covered the deeper water strata (366-732 m) not surveyed in previous years. Biomass in the depth range (366-545 m) was substantial in Div. 3O in 1991, but was considerably lower in 1992 and 1993. Abundance estimates for this depth zone were also low in 1993. Biomass and abundance for these depth zones in Div. 3N were not substantial. Information was not available to determine whether the 1991-93 distributions were similar to previous years when this depth had not been covered.

Additional stratified-random surveys have been conducted by Canada during autumn in 1990-93. Biomass and abundance estimates were at similar levels in 1990-91 in Div. 3O but were considerably lower in 1992 and 1993. Biomass estimates in Div. 3N had fallen in 1992 and 1993. Abundance in Div. 3N was much lower than in 1991 or 1992. The age composition from the 1993 survey indicated that the 1989 year-class which had been strong in 1991 and 1992 surveys had declined substantially.

Canada has conducted stratified-random surveys during the August-September period in Div. 3NO since 1980 for the purpose of estimating abundance of juvenile as well as adult groundfish. The surveys since 1988 have covered depths to 150 fathoms. The results of these surveys indicate that Div. 3NO cod biomass and abundance (Fig. 3) increased from 1989 to 1991 but have since decreased. The 1989 and 1990 year-classes were both strong in this series.

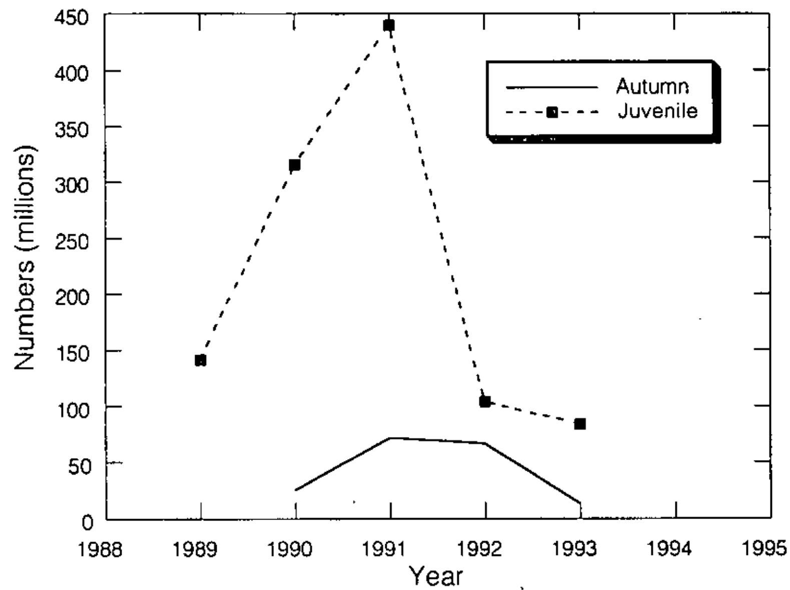


Fig. 3. Cod in Div. 3NO: abundance estimates from Canadian autumn and juvenile research vessel survey data.

The 1993 Russian survey indicated an upward trend in the cod stock in Div. 3NO (Fig.2). Although the biomass estimates for 1993 were lower than for 1991 when the last Russian survey was conducted, abundance of the stock was reported to be increasing. Fish at ages 2-6 were observed to be especially numerous with individuals at ages 3 and 4 predominating.

c) **Estimation of Parameters**

i) **Sequential population analysis**

Formulations of the adaptive framework (ADAPT) and the Laurec-Shepherd (L/S) technique, including Canadian spring, autumn and juvenile groundfish surveys and Russian research vessel survey data (for the ADAPT analysis only), were used for the determination of stock size for 1993. Results from ADAPT indicated that coefficients of variation (CV) on the age 4 to 11 abundance estimates were in the range of 30% to 37%, while that on the age 3 estimate was higher at approximately 49%. All research vessel catchabilities were estimated with CV between 23 and 50%. Residuals indicated no obvious trends but all survey indices contained several year effects, both positive and negative. The CV on all abundance estimates and the patterns of residuals described above suggested some uncertainty with the results of this calibration analysis. Similar comments regarding uncertainty were also made during the previous four assessments of this stock (NAFO Scientific Council Reports, 1990, 1991, 1992 and 1993) and were attributed to large year-to-year variation in survey estimates as well as poorly estimated removals-at-age.

An analysis using the L/S technique was also conducted using Canadian spring research vessel data only from 1984 to 1993, as well as Canadian autumn and juvenile groundfish data from 1990 to 1993. Most of the structure and data were the same as included in the

ADAPT analysis except that the oldest age Fs were set to the mean of the previous five ages (7-11) instead of ages 7-10. Autumn survey estimates were used without adjustments to the beginning of the following year. Standard errors of F were large at the young ages for the Canadian spring and juvenile groundfish surveys. Those for the autumn survey were generally larger than the other survey indices. As with ADAPT, no trends were evident in log catchability residuals.

ii) **Estimation of partial recruitment**

Assessments of this stock for the years 1990 to 1993 have included a formulation of ADAPT for which partial recruitment (PR) was estimated to be 'dome' shaped; the F on the oldest age group was estimated at 40% of the fully recruited F (mean of ages 7-10). During the June 1993 assessment, analyses were presented indicating that different interpretations of stock status were produced depending on the option of PR that was considered most appropriate. In June 1993 it was recommended that additional analysis be conducted to assess the impact of PR on the interpretation of stock status and determine the most appropriate approach.

The basis for adoption of a 40% dome on the oldest age group was related to patterns observed in the ADAPT research vessel catchability estimates (K) (NAFO Scientific Council Report, 1990). Earlier assessments suggested that Ks should be at least stable, if not declining, through older ages. Catchabilities obtained assuming a 'flat-topped' PR indicated increasing values at age for both Canadian and Russian research vessel indices. When fishing mortalities on oldest ages were set at 40% of those at fully recruited ages, more stable catchabilities for older ages in the research vessel indices were produced.

For the current assessment, similar analyses were conducted. A formulation of ADAPT was used assuming flat-topped PR and a dome of 40%. In this analysis, additional indices were included (Canadian autumn research vessel and juvenile groundfish). The catchabilities produced showed similar patterns with those in earlier analyses. As the dome approached a flat-topped PR, K values for the spring Canadian research vessel index showed an increasing trend, mainly at ages 9 and older. Russian research vessel data showed a similar but less pronounced effect. With the exception of values for the oldest age in the calibration (age 11), the Canadian autumn K values decreased at all ages older than 6, with the effect becoming more pronounced with an increasing dome. Juvenile groundfish survey K estimates were high at age 3 and declined at all subsequent ages with the exception of a high value at age 11.

Biomass estimates were obtained from cohort analyses using the options of PR described above in ADAPT analyses. A 40% dome produced biomass estimates that were about 80% higher in the mid-1980s, than with the flat-topped PR. This would also imply that biomass in the mid-1980s was as large or larger than that in the late-1960s when landings were consistently in excess of 100 000 tons. Research vessel biomass estimates peaked in the mid-1980s, but there were no survey estimates in the late-1960s for similar comparisons. Particularly the SSB estimates obtained with the dome shaped PR in the mid-1980s were well above what had been estimated for other periods in the time series. Comparing the catches taken in mid-1960s and mid-1980s, these SSB of mid-1980s appeared unrealistic.

The data presented indicated that the validity of procedure previously used for estimation of an appropriate level of PR for the fully recruited ages was not clear, and that the consequent influence on the interpretation of stock status was substantial. STACFIS found that the flat-topped assessment better reflected the stock trends than the dome-shaped assessment. STACFIS, however, considered that the data and analysis provided were not sufficient to determine the most appropriate PR. Consequently stock status was considered using population estimates derived from both flat-topped and domed shape PR for the 1977-93 period.

d) **Assessment Results**

As for the 1993 assessment, results from ADAPT were used as the best estimate of stock status (Fig. 4-7). Population (age 3+) biomass estimates from both options of PR indicated declines from recent highs in the mid-1980s but at substantially different levels. The beginning of year biomass of 1993 from a domed PR (95 000 tons) was almost twice as large as that from a flat-topped PR (48 000 tons). This difference was also observed in the mid-1980s. Population numbers (age 3+) from both options of PR indicated declines from recent highs in the mid-1980s. Estimates increased after 1991 for both as the result of relatively large estimates for the 1989 and 1990 year-classes (respectively, 47 and 33 million from flat-topped; 57 and 40 million from domed). The 1993 assessment estimated the 1989 year-class at about 38 million at age 3, but for projection purposes, was set at 20 million, the geometric-mean for recent years (NAFO Scientific Council Reports, 1993).

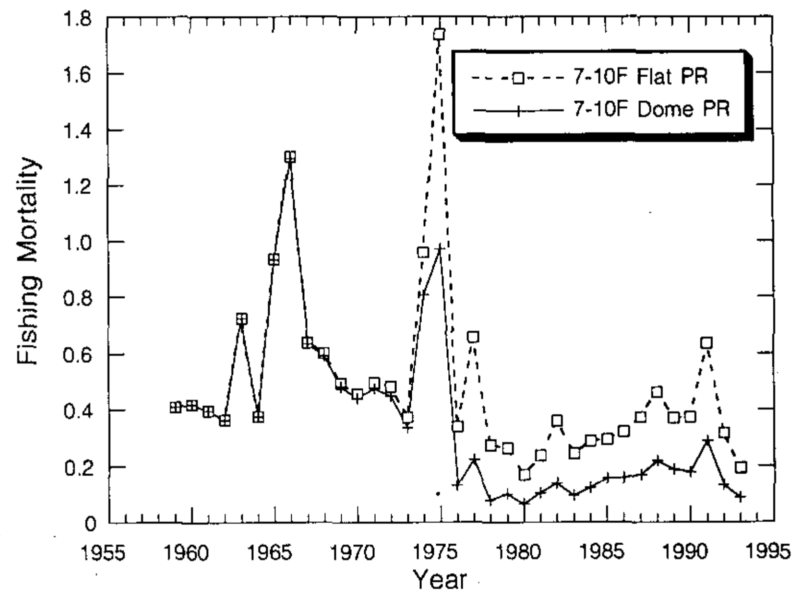


Fig. 4. Cod in Div. 3NO: age 7-10 mean fishing mortalities from SPA with domed and flat-topped PR.

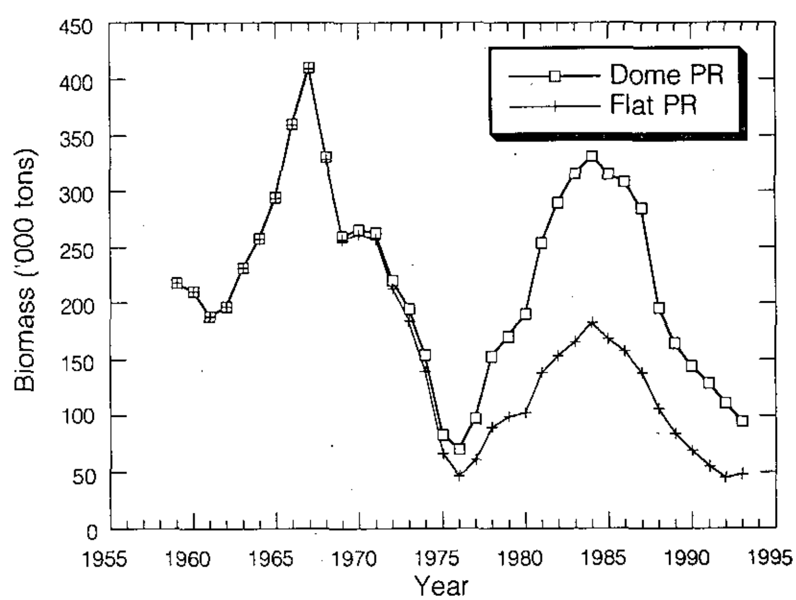


Fig. 5. Cod in Div. 3NO: age 3+ SSB from SPA with domed and flat-topped PR.

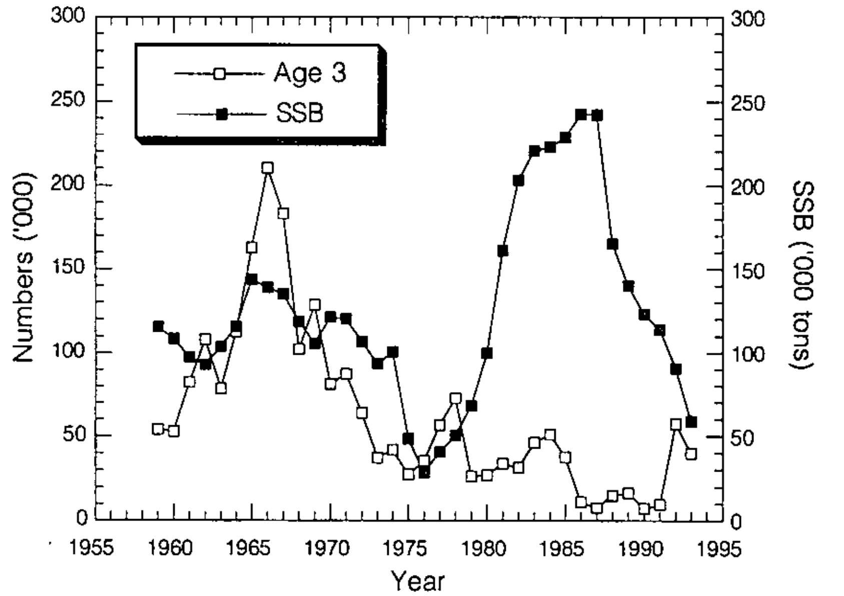


Fig. 6. Cod in Div. 3NO: SPA age 3 numbers and SSB by year with domed PR.

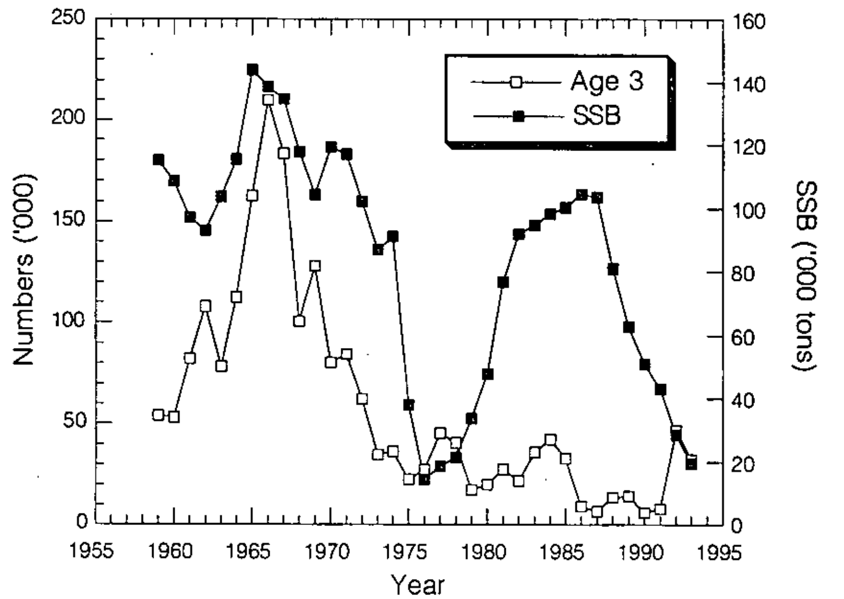


Fig. 7. Cod in Div. 3NO: SPA age 3 numbers and SSB by year with flat-topped PR.

The increased abundance estimate for the 1989 and 1990 year-classes resulted mainly from their strong appearance in the Canadian spring and Russian surveys during 1993. The confidence limits about the 1993 estimates were large for both of these surveys. In the Canadian survey, most cod were found in two strata in Div. 3O. The Canadian autumn surveys in 1991 and 1992 also indicated a relatively strong 1989 year-class, while the autumn 1993 survey suggested a much smaller year-class size. Estimates from the juvenile groundfish survey in 1993 also indicated a decline in abundance for the 1989 and 1990 year-classes.

The stock in 1993 was represented mainly by the younger age groups (85-90% of the abundance and 40-60% of the biomass at ages 3 and 4, depending on the PR option).

These year-classes (1989 and 1990) have been in commercial catches since age 2 and have dominated the catch numbers-at-age since 1991. These year-classes will not contribute significantly to the spawning stock until age 6 (50% mature between ages 5 and 6), i.e. 1995 for the 1989 year-class and 1996 for the 1990 year-class.

e) **Consideration of Spawning Stock Biomass**

STACFIS reviewed two documents (SCR Doc. 94/1, 2) pertaining to cod in Div. 3NO which addressed the issue of spawner stock replacement and population sustainability. Both analyses were based on the assessment conducted in June, 1993.

In the first paper, spawning stock biomass was calculated based on annual estimates of the proportion mature-at-age from 1972 to 1992, and the past recruitments compared with the amount necessary to replace the spawner stock. Three techniques for determining the threshold replacement were examined. These were: F_{rep} which was defined as the level of fishing pressure above which the spawning biomass of a year-class over its lifetime falls below the spawning biomass of its parents on average, %SPR which was defined as the amount of spawner biomass from a single recruit at the average prevailing levels of fishing mortality, fish weights and proportions mature-at-age relative to that obtained at $F = 0$ expressed as a percent, and annual replacement which was the amount of recruitment required to replace the spawner stock that gave rise to it at the age specific fishing mortalities, fish weights and proportions mature that pertain to that year. The first two were average estimates, while the third was year specific.

All three techniques indicated that fishing mortality had been above levels to allow replacement in recent years. Recruitment was considered to be below replacement threshold from 1983 to 1989. STACFIS noted that current estimates placed the 1989 year-class very close to the replacement threshold.

One interesting observation was that during the period 1983 to 1987, there was low recruitment (measured as numbers-at-age 3) from relatively high estimates of spawner stock biomass. The reasons for this were unclear, but a number of possible explanations were discussed. It may be that fecundity or survival during the egg and larval stages was low during that period, or there could have been higher total mortality on the fish before they reached age 3 caused by fishing (discards) and/or environment. The assumption of a dome shaped PR (which increases the numbers of older mature fish in the population) may be incorrect, and the spawner stock size was not as great as estimated. It was also considered that the observations could have resulted from a combination of these factors. STACFIS commented that it would be interesting to carry out a similar analysis examining fecundity and the numbers of eggs produced,to look at changes over time in overall survival to age 3.

The second paper utilized fecundity information to estimate the sustainability of the stock. A population was described as sustainable when over the lifetime of an individual, survivorship and fecundity allowed it to replace itself. Such a population was, in theory, in equilibrium and did not change in abundance over time. The analysis involved the calculation of *r*, the intrinsic rate of natural increase which is '0' for a population in equilibrium, positive for an increasing population, and negative for a decreasing one. Temporal changes in estimates of *r* for Div. 3NO cod were in broad agreement with observed changes in abundance. The paper concluded that it was necessary to lower fishing mortality in order to improve the chances of stock sustainability.

STACFIS considered that these types of analyses were valuable in the provision of scientific advice, and steps should be taken to enable a closer linkage between the analyses and the most current assessment results.

f) **Prognosis**

Stock projections were conducted to the beginning of 1997 to determine $F_{0.1}$ catch in 1994 as well as the impact on spawning stock of both $F_{0.1}$ catch and fishery closure with respect to the 1989 and 1990 year-classes. The parameters which were used to project stock size and SSB are given in Table 1. Population numbers in 1993 were obtained from ADAPT formulations with both flat-topped and domed PR. Mean weights-at-age were averages of values from 1990 to 1993. The PR patterns were recalculated based on average Fs for 1991-93. In the June 1993 assessment the 1990 estimates were included in the average PR but these now appeared anomalous and were therefore discarded.

Table 1. Cod in Div. 3NO: parameters used in projections of catch and stock biomass; partial recruitment values were averages for the 1991-93 period from the two analyses.

Age	Stock Size 1.1.1993 ('000 tons) Dome	Flat	Average Weights (kg) Start of year	Mean annual	Percent Mature	Partial Recruitment Flat	Dome
3	40 279	32 853	0.36	0.46	0.00	0.26	0.32
4	42 899	34 430	0.63	0.83	0.04	0.61	0.75
5	3 967	2 983	1.09	1.37	0.22	0.83	0.94
6	1 967	1 417	1.73	2.13	0.64	0.99	1.00
7	2 371	1 433	2.59	3.07	0.94	1.00	0.90
8	1 107	577	3.82	4.69	0.99	0.84	0.65
9	397	177	5.33	6.07	1.00	0.98	0.60
10	663	240	7.07	8.23	1.00	0.92	0.42
11	1 178	283	8.93	9.65	1.00	0.96	0.34
12	1 800	330	10.44	11.17	1.00	0.94	0.25
13	1 172	337	13.99	12.83	1.00	0.94	0.25

The results of these projections (Table 2; Fig. 6 and 7) indicated that an $F_{0.1}$ catch in 1994 could range from 10 600 tons to 18 900 tons depending on the option of PR.

About 66% of this catch biomass would be derived from the 1989 and 1990 year-classes. The beginning of the year SSB in 1995 could be 37 700 or 61 600 tons with fishing in 1994 and 44 600 or 73 700 tons with no fishing in 1994. The 1989 and 1990 year-classes would contribute between 45 and 60% of these SSB.

The rate at which SSB might recover is indicated in Fig. 8 and 9. The request for advice on Div. 3NO cod specifies that the SSB development should be set against a reference level calculated as the SSB in the mid-1980s. Figures 8 and 9 show the average 1982-87 SSB along with the 1989-90 SSB average for comparison. STACFIS could not determine an appropriate SSB reference but noted that recruitment was low during the mid-1980s.

Table 2. Cod in Div. 3NO: projections of 1994 catch and spawning stock biomass, reference fishing mortality levels assumed a domed and flat-topped PR in obtaining ADAPT population numbers for 1993.

Reference Fishing Mortality Levels	Catch (1994) (tons)	SSB (1.1.1995) (tons)
	Domed PR	
$F_{0.1} = 0.25$	18 871	61 649
$F_{max} = 0.40$	28 622	55 486
No Fishing	0	72 747
$F_{94} = 0.07$	6 000	69 878
	Flat-topped PR	
$F_{0.1} = 0.20$	10 609	37 709
$F_{max} = 0.30$	15 336	34 663
No Fishing	0	44 644
$F_{94} = 0.11$	6 000	40 767

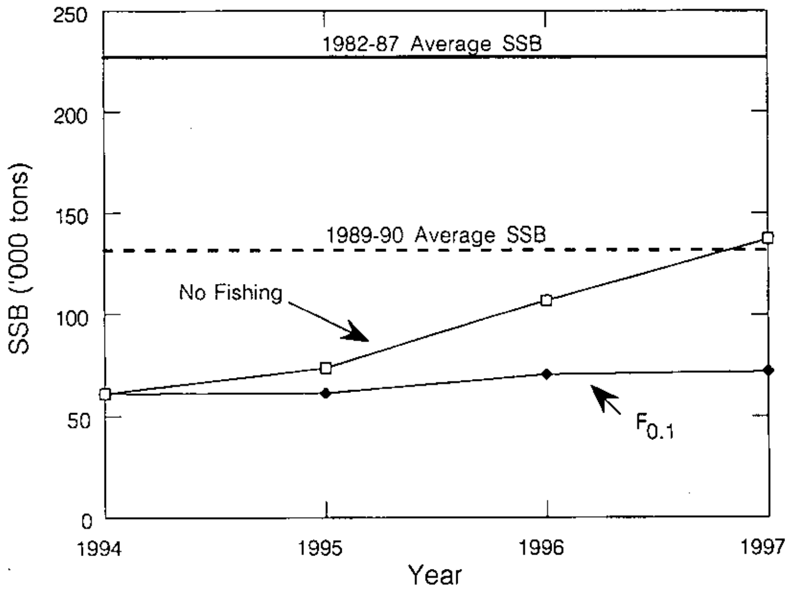


Fig. 8. Cod in Div. 3NO: projected beginning of year SSB (1994-1997) with domed PR and fishing options in relation to two average SSB levels.

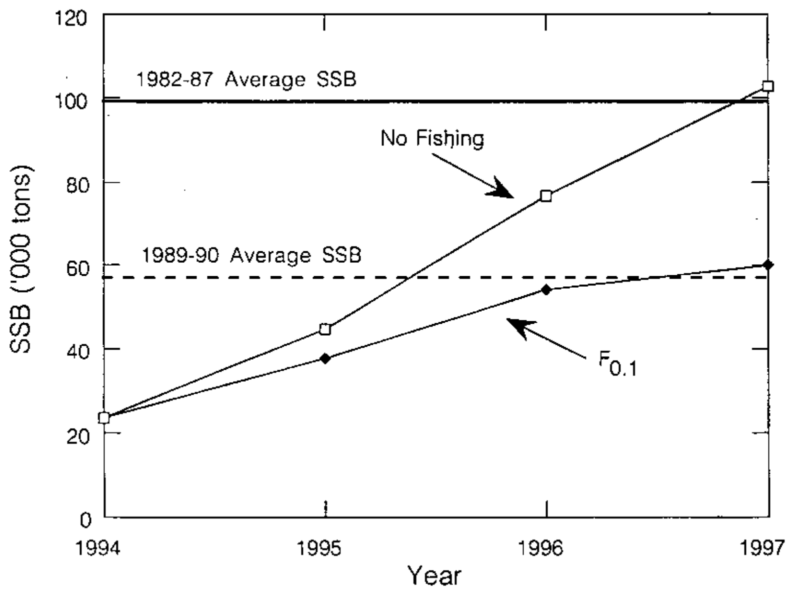


Fig. 9. Cod in Div. 3NO: projected beginning of year SSB (1994-1997) with flat-topped PR and fishing options in relation to two average SSB levels.

The calculated mid-1980s SSB averages were substantially different depending on the PR (227 000 tons with domed PR and 99 000 tons with flat-topped PR). With flat-topped PR, recovery to mid-1980s level would be achieved by 1997 only in the absence of a fishery, while with a domed PR option, the target would not be reached. The uncertainty of the appropriate PR, as discussed above in section c)ii on Estimation of partial recruitment, resulted in the inconclusive nature of the assessment at this meeting.

The determination of present and past stock levels is greatly influenced by the option of PR adopted. This issue could not be resolved at this meeting. STACFIS **recommended** that *the* *estimation of partial recruitment be addressed before the next assessment to include analysis to determine the most appropriate approach for determination of partial recruitment.*

Regardless of the option used in the current assessment, the analyses indicated that the stock has declined since the mid-1980s to levels at or approaching those in the mid-1970s. Projected stock increases in the near future are heavily dependant on the current size of the relatively large 1989 and 1990 year-classes, as the preceding 6 year-classes (1983-88) have been well below average. The current assessment estimates the 1989 year-class to be larger than estimated in the previous assessment.

The survey indices used in the present assessment gave somewhat different interpretations as to the abundance of these year-classes. Two new indices (Canadian autumn and juvenile groundfish surveys) although representing a relatively short time series (4 and 5 years, respectively) indicated a reduction in these year-classes in 1993, while the indices that cover a longer time series and that have been used in most previous assessments (Canadian and Russian spring surveys) suggested a very large increase in the abundance of the 1989 and 1990 year-classes. Distributions of the catches of these ages (3 and 4) in the Canadian survey were from two strata on the slope of the bank and the results from both surveys indicated wide confidence limits about the 1993 abundance and biomass estimates. Large year effects have been observed in the indices in previous years (e.g. 1987), and consequently the results from the 1993 spring surveys should be treated with some caution until the results can be evaluated by further surveys.

The present assessment of the state of the Div. 3NO cod confirmed that the population, and hence a fishery in 1994, would depend mainly on the 1989 and the 1990 year-classes, older year-classes are at a low level.

The assessment confirmed the undesirable PR pattern - the relative high exploitation rate of immature fish are in excess of what is considered prudent. This catch of immature cod represents a sub-optimal use of the resource in yield-per-recruit terms as noted in June 1993. The catch of small cod also decreases future SSB compared to the SSB possible under a better PR. STACFIS therefore reiterated its **advice** from June 1993:

> "All necessary steps should be taken to eliminate the catch of small fish from this stock".

The precision of the estimate of strength of the 1989 year-class has been improved by including the 1993 survey results in the analysis. The 1993 Canadian and Russian spring surveys both found the 1989 and 1990 year-classes to be abundant. However, the two autumn surveys gave a less optimistic view of these year-classes. Weighing the estimates together provided an estimate of 47 million fish compared with the estimate obtained in June 1993 of 38 million for the 1989 year-class and an initial estimate of the 1990 year-class in the range of 30-40 million depending on the PR. However, the Canadian spring survey found the 1989 year-class predominantly in two strata only and both spring survey estimates had very much larger confidence limits. Given the conflicting evidence from the autumn surveys STACFIS **advised** that for 1994 as given in June 1993 be left unchanged:

> "The 1994 catch should not exceed 6 000 tons".

STACFIS emphasized that this catch level is an upper limit and should not be interpreted as a recommended TAC.

STACFIS recognized that the fishery on the year-classes 1982-88 did not allow the stock to replace itself. The low recruitment of the year-classes 1983-88 and the fishery have depleted the SSB, and STACFIS **advised** that the stock be allowed to rebuild. The first chance of such a rebuilding is the 1989 and perhaps the 1990 year-classes which will only add substantially to the spawning stock at age 6 in 1995 and 1996, respectively. STACFIS noted that any harvesting would reduce the rebuilding potential.

2. Other Matters

There being no other business, the Chairman thanked the Committee members for their good cooperation and adjourned the meeting.

Participants of June 1994 Scientific Council Meeting

(From left to right)

FRONT ROW – D. Stansbury, A. Avila de Melo, D. Auby, J. Boje, M. Stein, A. Vazquez, F. Serchuk, T. Amaratunga, K. Yokawa, J. Morgan, S. Goddard, M. Godinho, E. Colbourne, D. Power

SECOND ROW – L. Motos, B. Brodie, O. Jørgensen, H. Lassen, F. Rodriguez, K. Drinkwater, H.-J. Rätz, B. Davis, C. Bishop, H. P. Cornus, B. Atkinson, S. Kovalev, V. Rikhter, E. De Cárdenas, A. Battaglia, J. Beckett, G. Glenn

PART B

Scientific Council Meeting, 8-22 June 1994

CONTENTS

REPORT OF SCIENTIFIC COUNCIL

8-22 June 1994

Chairman: H. Lassen Rapporteur: T. Amaratunga

I. PLENARY SESSIONS

The Scientific Council met at the Keddy's Dartmouth Inn, 9 Braemar Drive, Dartmouth, Nova Scotia, Canada during 8-22 June 1994, to consider the various matters listed in its agenda (see Agenda II, Part E, this volume).

Representatives attended from Canada, Cuba, Denmark (in respect of Faroe Islands and Greenland), European Union (Denmark, France, Germany, Portugal and Spain), Japan and Russian Federation, and an observer from United States of America. The Executive Secretary and Assistant Executive Secretary were in attendance.

The Executive Committee met prior to the opening session of the Council, and the proposed reorganization of the Scientific Council, the provisional agenda and work plan were discussed.

The opening session of the Council was called to order at 1020 hours on 8 June 1994.

The Chairman welcomed everyone to the new venue for this meeting. The Assistant Executive Secretary was appointed rapporteur. The Council reiterated its standing invitation to the USA, welcoming F. M. Serchuk, National Marine Fisheries Service, Woods Hole, as an observer to this meeting. The three Angolan observers who had been invited by the Council (SC-94/79) had conveyed their regrets to the Secretariat indicating they were unable to attend.

The Council was informed by the Executive Secretary, that in accordance with Rule 2.3 of the Rules of Procedure with respect to proxy votes, he had received authorization from Norway and Poland to record their abstentions during any voting procedures.

The Council noted that discussions regarding NAFO fisheries currently appearing in the Canadian public media were completely independent of the NAFO Scientific Council processes, and that any public releases of the Scientific Council deliberations could only occur when the adopted Scientific Council report of this meeting was available to Contracting Parties.

In introducing the provisional agenda, the Chairman noted that the Council had been requested by Canada and the EU, to further consider the issues of a) the minimum fish landing sizes for witch, redfish and Greenland halibut, and b) the conversion factors to live weight for various fish products, as requested by the Fisheries Commission for the 19-23 November 1993 meeting of the Scientific Council. The Council agreed to include these agenda items.

The Council also agreed that a proposal to have the meeting of ICES/NAFO Working Group on harp and hooded seals should be discussed with the Chairman of the Working Group.

The Chairman then reviewed the proposal to reorganize the Scientific Council. The Council agreed that the Chairman in consultation with the Executive Committee would draft a paper for consideration during this meeting. It was, however, agreed that a new Standing Committee titled the Standing Committee on Fisheries and Environment (STACFEN) would replace the present Environmental Subcommittee of STACFIS.

Recognizing that item 9 on the Provisional Agenda would now be undertaken by STACREC, the Council **adopted** the modified agenda (see Agenda II, Part E, this volume).

The Chairman's proposal to appoint a Nominating Committee composed of B. Atkinson (Canada) and A. Vazquez (EU-Spain) was accepted for the purpose of nominating a chairman for the Standing Committee on Fisheries Science (see Section IX).

The session was adjourned at 1200 hours on 8 June 1994.

The Council met briefly on 11 June 1994 to consider proposals for the Special Sessions of 1994, 1995 and 1996. The discussions are reported in Section VII below.

The Council then considered STACPUB membership, and elected K. H. Nygaard (Denmark-Greenland) to replace P. Kanneworff (Denmark-Greenland), extending a note of appreciation for the valuable contributions of P. Kanneworff in STACPUB.

The session was adjourned at 1420 hr on 11 June 1994.

The Council briefly reconvened at 1410 hr on 15 June 1994 to review the proposed changes to the Rules of Procedure for Scientific Council presented by the Executive Committee. It was agreed that the Chairman would prepare a final document with the amendments proposed.

The session was adjourned at 1545 on 15 June 1994.

The Council again met at 1710 on 15 June 1994.

Noting that the Executive Secretary had received two additional proxy votes on 14 June 1994, from Korea and Lithuania, to form a quorum, the Council **adopted** by a unanimous vote the new **Rule 5.1** as reported below in Section V. The Council agreed that for logistic purposes the new **Rule 5.1** would come into effect on **1 January 1995**.

Recognizing that the Standing Committee on Fisheries and Environment (STACFEN) replaces the Environmental Subcommittee of STACFIS on 1 January 1995, the Chairman called for an election of a Chairman for STACFEN. M. Stein (EU-Germany), the present Chairman of the Environmental Subcommittee, was elected by unanimous consent. The Council extended its welcome to M. Stein and expressed its appreciation to him for his long and valuable contributions as Chairman of the Environmental Subcommittee.

The session was adjourned at 1720 hr on 15 June 1994.

The Council met again at 1510 hr on 17 June 1994.

The Chairman presented a working paper describing a comprehensive proposal for a Symposium titled "What Future for Capture Fisheries in the Northwest Atlantic" for September 1996. Recognizing this should evolve into a meeting of significant international interest, the Council agreed to initiate the planning process (see Section VII.3 below).

The Council was informed it had just received a request for scientific advice on harp and hooded seals from Denmark (Greenland), and agreed to refer the request to the ICES/NAFO Working Group on harp and hooded seals (see Section VI.1. below).

The Chairman of STACPUB informed the Council that J. E. Carscadden (Canada) would step down from STACPUB. The Council extended its appreciation to J. E. Carscadden for his valuable contributions to STACPUB, and elected J. Morgan (Canada) as a new member.

The session was adjourned at 1530 hr on 17 June 1994.

The Council met during 2120 to 2300 hrs on 21 June 1994 to consider summary sheets of assessments and the concluding session was convened at 0930 on 22 June 1994.

The Council considered the remaining Summary Sheets and reviewed the texts for the Responses to the Fisheries Commission and Coastal States (Section II.6 and II.7).

The Council elected W. B. Brodie as Chairman of STACFIS by unanimous consent to take office at the end of the September 1994 Annual Meeting (Section IX), and welcomed him.

Having addressed all outstanding matters, the Council **adopted** the Report of the Standing Committee on Fishery Science (STACFIS), Report of the Standing Committee on Research Coordination (STACREC), and the Report of the Standing Committee on Publications (STACPUB).

The Council then considered and **adopted** the Report of the Scientific Council of the 8-22 June 1994 Meeting.

The meeting was adjourned at 1230 hours on 22 June 1994.

The reports of the Standing Committees are appended as follows: Appendix 1 - Report of the Standing Committee on Fishery Science (STACFIS), Appendix II - Report of Standing Committee on Research Coordination (STACREC), Appendix III - Report of Standing Committee on Publications (STACPUB).

The Agenda, List of Research (SCR) and Summary (SCS) Documents, and the List of Participants of this meeting are given in Part E, this volume.

The Council's considerations on the Standing Committee Reports, and the other matters addressed by the Council follow in Sections II-XII.

II. FISHERY SCIENCE (see STACFIS report, App. I)

1. General Review

The Council welcomed the STACFIS review of stock status and the available data during the first day of the meeting. It was noted that this review enabled the representatives to undertake preliminary assessments before the full Committee met.

Special emphasis was given to Greenland halibut, and Subareas 0-3 was considered a single stock. Noting fishing on one component affects the catch possibilities on other components, it was agreed all components of the Greenland halibut stock should be regulated. This applied particularly to the new fisheries in the Flemish Pass in Div. 3LMN.

The yield taken of the Greenland halibut populations in recent years affects the populations significantly in all Subareas as is seen from declining catch rates and trawlable biomass. The same pattern is seen all throughout the offshore range.

There has been a significant amount of information collected which suggests that Greenland halibut in the northern West Greenland fiords (Div. 1A) do not contribute to the spawning stock in the offshore areas in Davis Strait and STACFIS **advised** that a separate TAC be established for the inshore areas of Div. 1A.

2. General Fishery Trends

The Council was disappointed that STATLANT 21A data had not been submitted to allow a general review of fishery trends. It was agreed that this analysis would not be done this year, although this analysis is considered a valuable annual overview of the fisheries in the Northwest Atlantic, Subareas 0-6*.

3. Review of Recommendation from the 1993 Meetings

The Council endorsed the STACFIS **recommendation** that Scientific Council Research documents (SCR), excluding the preliminary assessment documents, and the Scientific Council Summary documents (SCS), particularly National Research Reports, be submitted to the Secretariat 15 days before the beginning of the Council meeting. The Council, however, recognized that the deadline for submission of titles and brief summary set for this June 1994 meeting was not met for several papers and stressed the importance of this deadline for the smooth work of the Council and Secretariat.

* The data were subsequently received and summarized in SCS Doc. 94/25, Serial No. N2488, title 'General fishery trends for the Northwest Atlantic in 1993.

4. Environmental Research

The time scheduled for the Environmental Subcommittee at the beginning of the Council meeting had proven to be successful and the Council agreed that this should be continued. The Council recognized the importance of the contributions made by this Subcommittee and this was reflected in the establishment of the new Standing Committee STACFEN. The new STACFEN, effective as of 1 January 1995, takes on additional tasks, while the Environmental Subcommittee of STACFIS will be discontinued.

5. Assessment of Finfish and Invertebrate Stocks

The Council recognized that as a result of the recent closures of several fisheries in the Northwest Atlantic, important data from the fisheries activities will not be available. The assessments of the stocks will consequently be critically dependent on surveys. The importance of these survey data will therefore be increased, particularly for acoustic survey results since they provide absolute estimates of abundance. The Council agreed with STACFIS that survey studies should be encouraged.

The Council noted that STACFIS reviewed the status of certain stocks in Subareas 0-4 as requested by the Fisheries Commission, and the Coastal States Canada and Denmark (in respect of Faroe Islands and Greenland), and had advised on catch levels corresponding to reference levels according to the different requests. Management advice, based on the reference levels, could not be provided for several stocks due to insufficient data. Detailed assessments are given in the report of STACFIS at Appendix I, and the following summaries of the assessments were reviewed and adopted by the Council.

SUMMARY SHEET - Cod in Divisions 2J, 3K and 3L

Source of Information: SCR Doc. 94/12, 40; SCS Doc. 94/13.

Year	1987	1988	1989	1990	1991	1992	1993	1994
TAC	256	266	235	199	190	120[1]	[1]	[1]
Catch	235	269	253	219	150[2]	44[2]	11[2]	
Offshore catch	156	168	151	106	90[2]	32[2]	22[2]	
Fixed gear catch	79	101	103	113	60[2]	12[2]	9[2]	
Sp. stock biomass								
Recruitment (age 3)			N/A					
Mean F (ages 7-9)								

[1] Moratorium in effect on Canadian fishing since July 1992.
[2] Provisional.

Weights in '000 tons

Catches: Catches declined from a high of 810 000 tons in 1968 to a low of 139 000 tons in 1978. During 1982-90 catches ranged between 219 000 and 270 000 tons, however, a reduction to approximately 150 000 tons occurred during 1991 and further to 44 000 tons in 1992. A moratorium was imposed on the Canadian fishery in July 1992 and subsequently by the European Union on its fleet. Catches by the recreational, foreign (outside 200 miles), and by-catch fisheries in 1993 totalled approximately 11 000 tons. The moratorium was extended to include the recreational fishery in January 1994.

Data and Assessment: The principle index of abundance is the Canadian autumn research vessel survey index. From 1978 to 1990, the catch-per-tow averaged about 50 cod with the 1990 catch-per-tow equal to the average. The catch-per-tow decreased to 33 fish in 1991. The decline was more pronounced for fish age 6 and older. Despite the severe reduction in fishing activity as a result of the moratorium, the catch-per-tow decreased further during the 1992 and 1993 surveys to 9 and 2 fish, respectively.

Fishing Mortality: Although stock size and fishing mortality could not be estimated, analysis incorporating the extremely low RV abundance for 1993 suggest that total mortalities in recent years have been very high and most likely in excess of 1.0 for the fully recruited age groups. The continued drastic decline in survey abundance occurred in the virtual absence of an offshore fishery and with a low 'recreational' fishery.

Recruitment: The 1986 and 1987 year-classes were originally estimated to be strong, but subsequent analysis suggested a downward revision of the estimates such that they now appear to have been below average. Survey data would suggest that year-classes since that time are weak. Spawning stock biomass remains low, and based on previous analyses strong recruitment is not anticipated.

State of Stock: There is little doubt that the stock has declined substantially with abundance and biomass probably at an all-time low.

Forecast for 1995: Current data suggest further stock declines. No fisheries should be considered until there is evidence of adequate recovery.

Environmental factors: Temperatures recorded at Station 27 during the 1990s been anomalously low when compared with the mean for years since 1946.

Long term prospects: Before the expansion of the fishery in the 1960s catches had generally been in the 200 000 to 300 000 tons range. During the 1960s, good recruitment along with exploitation rates ranging from 25% to 50% saw catches averaging about 580 000 tons. Given the current depressed state of the stock which continues to decline, the low current spawning stock biomass, and the apparent low recruitment levels of recent years, stock recovery in terms of total and spawning stock biomass is not possible in the next 5-7 years. Stock recovery cannot begin until there is production and survival of significant numbers of new recruits.

Special Comment: Total mortality derived from surveys appeared to have declined between 1992 and 1993, presumably because of the fishery closure, but the level of mortality is too high to be explained by a catch of 11 000 tons. Possible reasons for this inconsistency include the following: 1) factors other than fishing are responsible for the observed declines; 2) year effects of the surveys in recent years are hampering calibration of SPA; 3) the 1993 catch has been underestimated. It is not possible to determine which of these or a combination might be correct. It is possible that the recreational fishery in 1993 took fish predominantly originating from supposed inshore stocks. The areas where these fish would occur are not covered during the autumn surveys, and no information exists concerning possible trends in inshore 'stock' abundance.

SUMMARY SHEET - Cod in Division 3M

Source of Information: SCR Doc. 94/12, 22, 26, 62; SCS Doc. 94/3, 13, 16

Year	1987	1988	1989	1990	1991	1992	1993	1994
Recommended TAC	0	0	0	0	0	0	0	0
Agreed TAC	13	0	0	0	13	13	13	11
Reported catches	11	2	1	2	8[1]	6[1]	5[1]	
Non-reported catches		-[2]	39	30	3	5	7	
Total landings	11	2	40	32	11[1]	11[1]	13[1]	
Sp. stock biomass	No information available							
Recruitment (age)								
Mean F								

[1] Provisional.
[2] No information available.

Weights in '000 tons

Catches: Catches ranged from 22 000 to 33 000 tons in late-1970s and were stable around 12 000 tons for 1980-87. Reported nominal catches were less than 2 000 tons from 1988 to 1990. Actual catches were estimated to be around 40 000 tons in 1989 and 31 500 tons in 1990. Total catch in 1993 was estimated to be 12 500 tons.

Data and Assessment: Available data include biological data from the commercial fisheries, catch-rate series from Faroese longline fishery, trawl survey by USSR/Russia since 1971 and by EU since 1988.

Fishing Mortality: Uncertain but assumed to be high.

Recruitment: The 1990 and 1991 year-classes appear stronger than the other year-classes currently in the population.

State of Stock: Surveys conducted by USSR/Russia since 1971 indicated that biomass and abundance had declined to a minimum in 1987. Both USSR/Russia and EU surveys showed an increase in stock biomass from 1988 to 1989 due to a relatively abundant 1986 year-class, a decrease since then to 1992, and an increase from 1992 to 1993, due to the income of two relatively abundant year-classes, those of 1990 and 1991.

Forecast for 1995: No forecast available.

Option Basis	Predicted catch (1995)	Predicted SSB (1.1.1996)
$F_{0.1}$ =	No information available	
F_{93} =		
F_{max} =		

Recommendations: No directed fishery on cod in Div. 3M be conducted in 1995, to allow stock recovery.

Special Comments: A trawl fishery in 1995 would be based on the 1990 and 1991 year-classes when they are 5 and 4 years old respectively, if the current fishing pattern is maintained. Both year-classes appeared relatively abundant in the Russian and EU surveys when they were of ages 2 and 3 in July 1993, but they would be noticeably reduced at the beginning of 1995, after supporting the fishery in 1994. These two year-classes offered the opportunity to rebuild the spawning stock.

SUMMARY SHEET - Cod in Divisions 3N and 3O

Source of Information: SCR Doc. 94/12, 30, 51, 87; SCS Doc. 94/2, 3, 13, 16

Year	1987	1988	1989	1990	1991	1992	1993	1994
Recommended TAC				Same as agreed				
Agreed TAC	33	40	25	18.6	13.6	13.6	10.2	6[1]
Reported catches	42	43	33	18	17[2]	10.1[2]	9[2]	
Non-reported catches	-	-	-	11	12	2.5	0.7	
Total landings	42	43	33	29	29[2]	12.6[2]	9.7[2]	
Sp. stock biomass from maturity ogive:								
Recruitment (age 3)			See SCS Doc. 94/2 and Special Comments below.					
Mean F (ages 7-10):								

[1] No fishing.
[2] Provisional.

Weights in '000 tons

Catches: There was no new catch information to update the information presented in the February 1994 assessment.

Data and Assessment: Sampling data were available from the Portuguese gillnet and otter trawl fishery from 1993. Data were used in the previous formulation of ADAPT and the results indicated that the differences were marginal. Information was presented relative to the most appropriate partial recruitment (PR) for this stock. An extension of the statistical model used to estimate abundance from commercial catch-at-age data was formulated to model the fishing mortality on the oldest ages. The analysis presented indicated that no significant difference could be found from that of a flat topped PR. Based on this, the Council concluded that this was the most appropriate pattern to use.

Fishing Mortality: New sampling information from the Portuguese fleet only slightly increased fishing mortalities on most ages. No further analyses were conducted at this time. The February 1994 assessment indicated that Fs declined in 1992 and 1993 but were particularly high on younger, immature ages.

Recruitment: The February assessment indicated that the 1989 and 1990 year-classes were above the abundance average of the 1974-88 year-classes. The total abundance estimate from the 1994 spring survey was 6% of that in 1993 and suggests that the spring 1993 estimates may have been optimistic.

State of Stock: The stock is comprised mainly of young, immature fish. The number of older, mature fish continues to decline. Rebuilding of the spawning stock biomass in the short term is dependant on the 1989 and the 1990 year-classes surviving to maturity. It will be another one to two years before the majority of these fish are sexually mature.

Forecast for 1995:

Option Basis	Predicted catch (1995)	Predicted SSB (1.1.1996)
$F_{0.1}$ =		
F_{93} =	No information available	
F_{max} =		

Recommendations: The stock must be allowed to rebuild. There should be no fishing for cod in Div. 3N and 3O in 1995.

Special Comments: High variability in the 1993 Canadian and Russian spring RV survey data, as well as conflicting evidence between spring and autumn surveys, dictate caution in the interpretation of the strength of the 1989 and 1990 year-classes. The low preliminary total biomass and abundance estimates from the 1994 Canadian spring survey reaffirm this caution.

The spawning stock biomass cannot begin to recover unless the 1989 and 1990 year-classes survive to maturity. This will not happen if fisheries on immature ages continue at current high levels. Any harvesting of this stock will reduce the rebuilding potential.

The Council is unable to provide projections of reference level catches in 1995 until all 1994 survey data have been analyzed.

SUMMARY SHEET - *Redfish in Subarea 1*

Source of Information: SCR Doc. 94/6, 7, 9, 31; SCS Doc. 94/11, 14, 15.

Year	1987	1988	1989	1990	1991	1992	1993	1994
Recommended TAC				No TAC				
Agreed TAC	19	19	19	19	19	19	19	19
Reported Catches	1	1	1	0.4	0.3[1]	0.3[1]	0.3[1]	
Total landings	1	1	1	0.4	0.3[1]	0.3[1]	0.3[1]	
Sp. stock biomass								
Recruitment (age 2)				No information available				
Mean F								

[1] Provisional.

Weights in '000 tons

Catches: Redfish are mainly by-catches in the cod and shrimp fishery. Reported catch in 1977 was 31 000 tons. Recent catches were lowest on record. Substantial numbers of small redfish are discarded as by-catch in the shrimp fishery but not reported.

Data and Assessment: Abundance and biomass estimate from stratified-random bottom trawl surveys designed for cod, shrimp and Greenland halibut. No commercial fishery data were available.

Fishing Mortality: No estimates.

Recruitment: No direct estimates but information from surveys on nursery grounds indicated high abundance of juveniles off West Greenland.

State of Stock: Survey estimates indicated a decline of biomass and abundance of the adult stock components of both golden and beaked redfish to an extremely low level.

Forecast for 1995: No projections.

Option Basis	Predicted catch (1995)	Predicted SSB (1.1.1996)
$F_{0.1}$ =		
F_{93} =	No information available	
F_{max} =		

Recommendations: Directed catches and by-catches of redfish in Subarea 1 be reduced to the lowest possible level.

Special Comments:

SUMMARY SHEET - Redfish in Division 3M

Source of Information: SCR Doc. 94/13, 22, 60; SCS Doc. 94/3, 13, 14, 16

Year	1987	1988	1989	1990	1991	1992	1993	1994
Recommended TAC	20	20	20	<50	43	35	<20	20
Agreed TAC	20	20	20	50	50	43	30	26
Reported catches	44	23	48	67	41[1]	29[1]	21[1]	
Non-reported catches			10	14	7	14	8	
Total landings	44	23	58	81	48[1]	43[1]	29[1]	
Sp. stock biomass								
Recruitment				No information available				
Mean F								

[1] Provisional.

Weights in '000 tons

Catches: Averaged 20 000 tons or less from 1979 to 1985. Increased thereafter to 44 000 tons in 1987, and declined to 23 000 tons in 1988. In 1990 the catch of 81 000 tons was the highest in the history of this fishery. Since then catches have declined to 29 000 tons in 1993. Catches for 1990-92 have been revised based on updated information related to the catches by non-Contracting Parties.

Data and Assessment: Standardized catch-rate series, bottom trawl and acoustic survey indices.

Fishing Mortality: No estimate available.

Recruitment: Both EU and Russian surveys in 1993 indicated proportionately high occurrence of juvenile redfish, however, the abundance of this cannot be quantified.

State of Stock: Biomass has declined at least from 1988 to 1991-92.

Forecast for 1995:

Option Basis	Predicted catch (1995)	Predicted SSB (1.1.1996)
$F_{0.1}$ =		
F_{93} =	No information available	
F_{max} =		

Recommendations: Total catch of redfish in Div. 3M be reduced to 20 000 tons for 1995.

Special Comments: There continues to be a substantial fishery for shrimp in Div. 3M. The Council expresses its concern on the likely negative impact of these fisheries on future recruitment to the redfish fisheries. While full information for 1993 may be made available when the shrimp resources in this Division will be assessed in September, the Council considers that the annual information should be made available in advance of the June meeting when the status of Div. 3M redfish is to be assessed.

SUMMARY SHEET - Redfish in Divisions 3L and 3N

Source of Information: SCR Doc. 94/13, 54; SCS Doc. 94/13, 16

Year	1987	1988	1989	1990	1991	1992	1993	1994
Recommended TAC	25	25	25	25	14	14	14	14
Agreed TAC	25	25	25	25	14	14	14	14
Reported catches	71	45	32	25	22[1]	15[1]	15[1]	
Non-reported catches	8	8	2	4	4	12	4-9	
Total landings	79	53	34	29	26[1]	27[1]	19-24[1]	
Sp. stock biomass	No information available							
Recruitment (age)								
Mean F								

[1] Provisional.

Weights in '000 tons

Catches: Average catch was about 20 000 tons prior to 1985. In 1986, catches doubled to 43 000 tons and increased again in 1987 to 79 000 tons. Since then catches have declined steadily to 26 000 tons in 1991. Cannot precisely determine 1993 catch but likely between 19 000 and 24 000 tons. TAC has been exceeded each year since 1985.

Data and Assessment: Catch-rate indices derived for Div. 3L and Div. 3N were generally not considered reflective of year-to-year changes in stock abundance. However, all indices indicated a general decline since mid-1980s. Bottom trawl surveys by Russia in Div. 3LN and Canada in Div. 3L suggested decline since 1984.

Fishing Mortality: No estimate available.

Recruitment: No estimate available but appeared poor in Div. 3L since the early-1980s. In Div. 3N, a mode appeared in Russian and Canadian surveys in 1991 at 12-14 cm. Given the variability in the survey estimates, the magnitude of this recruitment could not be determined. However, there were no sign of any year-classes subsequent to this in the surveys.

State of Stock: Available indices exhibit considerable between-year variability but generally indicate a stock at a low level, especially in Div. 3L.

Forecast for 1995:

Option Basis	Predicted catch (1995)	Predicted SSB (1.1.1996)
$F_{0.1}$ =	No information available	
F_{93} =		
F_{max} =		

Recommendations: Total catch of redfish in Div. 3LN for 1995 not to exceed 14 000 tons.

Special Comments: *Catches by non-Contracting Parties in recent years have ranged from 7 000 tons in 1991 to 24 000 tons in 1987.*

SUMMARY SHEET - Silver Hake in Divisions 4V, 4W and 4X

Source of Information: SCR Doc. 94/4, 8, 32, 39; SCS Doc. 94/3

Year	1987	1988	1989	1990	1991	1992	1993	1994
Recommended TAC	100	161	235	-	100	105	75	51
Agreed TAC	100	120	135	135	100	105	86[1]	30
Reported catches	62	74	91	70	68[2]	32[2]	29[2]	15[3]
Sp. stock biomass	234	195	183	174	166	147	-	-
Recruitment (age 1)[4]	822	787	1 168	933	943	798	1 200[3]	1 100[3]
Mean F (avg ages 3-5)	0.73	0.76	1.52	0.95	1.40	0.55	0.32	

Weights in '000 tons

[1] Catches additional to the advised $F_{0.1}$ catch were allocated with the knowledge that not all allocations would be utilized fully.
[2] Provisional.
[3] Estimated.
[4] Numbers in '000 000.

Catches: Peaked in 1973 at 300 000 tons. In recent years catches have dropped from 91 000 tons in 1989 to 29 000 tons in 1993. The 1993 level was the lowest catch in the time series.

Data and Assessment: Catch-at-age from 1977 to 1993 were included in a formulation of ADAPT using research vessel (juvenile and adult) and commercial CPUE indices.

Fishing Mortality: Fully recruited F for ages 3-5 was 0.32 in 1993.

Recruitment: The 1992 year-class is thought to be above average (1972-92 geometric mean) while the 1993 year-class is estimated to be average.

State of Stock: Commercial standardized catch rates have dropped since 1989, but remained stable over 1992-93 at approximately 40% of the 1989 level. Results of July research vessel surveys showed declining numbers and biomass from 1986 to 1992. The 1993 survey showed a moderate increase in numbers and biomass.

Forecast for 1995: Catch in 1994 was assumed at 15 000 tons. Increase in the size of the fished stock after 1993 results from recruitment of the 1992 year-class which will account for 50% of the catch in 1995.

Option Basis	Predicted catch (1995)	Predicted SSB (1.1.1996)
$F_{0.1}$ = 0.70	79 000	
F_{93} =		
F_{max} =		

Recommendations: For silver hake in Div. 4VWX, the catch at a target fishing level of $F_{0.1}$ in 1995 is 79 000 tons.

Special Comments: Projections based on retrospective analysis suggest that the projected $F_{0.1}$ catch in 1995 of 79 000 tons could be overestimated by as much as 20 000 tons.

SUMMARY SHEET - American Plaice in Division 3M

Source of Information: *SCR Doc. 94/22; SCS Doc. 94/3, 13, 16*

Year	1987	1988	1989	1990	1991	1992	1993	1994
Recommended TAC	2	2	2	2	2	2	2	1[1]
Agreed TAC	2	2	2	2	2	2	2	
Reported catches	5.6	2.8	3.5	0.8	1.6[2]	0.8[2]	0.3[2]	
Non-reported catches								
Total landings								
Sp. stock biomass								
Recruitment (age)				No information available				
Mean F								

[1] No directed fishing allowed.
[2] Provisional.

Weights in '000 tons

Catches: Ranged between 600 and 1 900 tons in 1974-85, then increased in 1986-89 to between 2 861 and 5 600 tons. From 1990 to 1993 the reported catches declined to levels below the TAC. Since 1992 there has been no fleet which directed its fishery to this stock.

Data and Assessment: Catch-at-age for 1988-93. Information from Russian surveys (1972-93) and EU surveys (1988-93) were used to evaluate stock status.

Fishing Mortality: Appears to have been high during the period 1988-91 and has drastically decreased since 1992, due to a shift in the target species of the main fleet which previously directed its efforts to this species.

Recruitment: The 1990 and 1991 year-classes appeared to be weak in 1993 EU survey. The 1986 year-class continues to be the strongest in the EU survey.

State of Stock: Both Russian and EU surveys show that relative abundance and biomass are at the lowest level since 1983. SSB increased in 1993 to the level of 1990-91 due to the recruitment of 1986 year-class, but it is still at a low level.

Forecast for 1995:

Option Basis	Predicted catch (1995)	Predicted SSB (1.1.1996)
$F_{0.1}$ =		
F_{93} =	No information available	
F_{max} =		

Recommendations: Catch of American plaice in Div. 3M in 1995 should not exceed 1 000 tons.

Special Comments: The recommended 1 000 tons for 1995 corresponds to the expected by-catch in non-directed fisheries.

SUMMARY SHEET - American Plaice in Divisions 3L, 3N and 3O

Source of Information: SCR Doc. 94/55, 56, 58; SCS Doc. 94/13, 16

Year	1987	1988	1989	1990	1991	1992	1993	1994
Recommended TAC	48	28	30.3	24.9	25.8	25.8	10.5	4.8
Agreed TAC	48	40[1]	30.3	24.9	25.8	25.8	10.5	4.8[2]
Reported catches	55	40.7	41.4	24.4	26[3]	10.6[3]	8.3[3]	
Non-reported catches	0	0.1	2.0	8.1	8	2.0	9.0	
Total landings	55	40.8	43.4	32.5	34[3]	12.6[3]	17.3[3,4]	
Sp. stock biomass								
Recruitment (age)				No information available				
Mean F								

[1] Effective TAC was 33 585 tons.
[2] No directed fishing allowed.
[3] Provisional.
[4] Catch may be as high as 19.4 thous. tons.

Weights in '000 tons

Catches: Highest catches occurred in the late-1960s with a peak catch of 94 000 tons taken in 1967. Catches were stable at about 50 000 tons during the 1970s. Overall catches declined to about 33 000 tons in 1990-91 and to only 12 600 tons in 1992, and 17 300 tons in 1993, the lowest values since the 1950s.

Data and Assessment: Sequential population analyses were not possible because age compositions were not available from 50% of the catch in 1993. Stock size indicated by surveys was extremely low in 1993. Canadian CPUE was at its lowest level in 1993. Portuguese otter-trawl CPUE increased from 1992 to 1993 in Div. 3N.

Fishing Mortality: Not possible to evaluate, although estimates of total mortality from surveys have increased at most ages.

Recruitment: Recruitment estimated from RV surveys have decreased to very low levels.

State of Stock: The stock is at a level far below the historic average, and has declined very rapidly in recent years. Surveys indicate that SSB has declined by 85% or more since the mid-1980s. Stock size in 1993 is estimated to be at the lowest level ever observed.

Forecast for 1995:

Option Basis	Predicted catch (1995)	Predicted SSB (1.1.1996)
$F_{0.1}$ =		
F_{93} =	No information available	
F_{max} =		

Recommendations: No fishing on American plaice in Div. 3LNO in 1995.

Special Comments: Virtually all indices of stock size are at their lowest levels ever, making stock rebuilding uncertain. Unregulated catches by non-Contracting Parties will continue to hamper the rebuilding of this stock.

SUMMARY SHEET - Witch Flounder in Divisions 3N and 3O

Source of Information: *SCR Doc. 94/49; SCS Doc. 94/12; 13*

Year	1987	1988	1989	1990	1991	1992	1993	1994
Recommended TAC	5	5	5	5	5	5	5	3
Agreed TAC	5	5	5	5	5	5	5	3
Reported catches	8	7	4	2.7	3.3[1]	4.8[1]	4.2[1]	-
Non-reported catches[2]				1.5	1.5	-	0.3	-
Total landings				4.2	4.8[1]	4.8[1]	4.4	-
Sp. stock biomass								
Recruitment (age)				No information available				
Mean F								

[1] Provisional.
[2] Data inadequate to estimate misreported catches prior to 1990.

Weights in '000 tons

Catches: In the period 1970-84 catches ranged from a low of 2 400 tons in 1980-81 to a high of 9 200 tons in 1972. From 1985 to 1988 catches exceeded the TAC by large margins, but have been stable in recent years near the level of the TAC.

Data and Assessment: Estimates of biomass from surveys and stock trends from Canadian commercial catch rates.

Fishing Mortality: Unknown.

Recruitment: Unknown.

State of Stock: Survey biomass in Div. 3N is at an extremely low level. Biomass in Div. 30 declined slightly during the 1984-90 period with average catches of 2 600 tons but declined more sharply up to 1993. Preliminary estimate for 1994 showed an increase.

Forecast for 1995:

Option Basis	Predicted catch (1995)	Predicted SSB (1.1.1996)
$F_{0.1}$ =		
F_{93} =	No information available	
F_{max} =		

Recommendations: *No fishing on witch flounder in 1995 in Div. 3N and 3O, to allow rebuilding to former levels.*

Special Comments:

SUMMARY SHEET - Yellowtail Flounder in Divisions 3L, 3N and 3O

Source of Information: SCR Doc. 94/44, 46, 58

Year	1987	1988	1989	1990	1991	1992	1993	1994
Recommended TAC	15	15	5	5	7	7	7	7
Agreed TAC	15	15	5	5	7	7	7	7[1]
Reported catches	16.3	16.2	9.1	8.8	11.0[2]	10.7[2]	6.8[2]	
Non-reported catches	0	0.1	1.1	5.1	5.3	0.1	6.8	
Total landings	16.3	16.3	10.2	14.0	16.3[2]	10.8[2]	13.6[2]	
Sp. stock biomass								
Recruitment (age)				No information available.				
Mean F								

[1] No directed fishing allowed.
[2] Provisional.

Weights in '000 tons

Catches: Catches were stable at 10 000-15 000 tons for most of the 1970s and early-1980s. They rose to about 30 000 tons during 1985-86 as effort increased in the Regulatory Area in Div. 3N. Catches ranged from 10 000 to 16 000 tons since 1986. Considerable uncertainty exists with the catch data for this stock.

Data and Assessment: No analytical assessment were possible due mainly to uncertainties with catch and catch-at-age data. Data from Canadian catch rates and Canadian and USSR/Russian RV surveys were used to determine trends in stock abundance.

Fishing Mortality: No information available on fishing mortality but total mortality was high at older ages.

Recruitment: The 1989-92 year-classes appeared to be average to below average, and appeared to be weaker than their immediate predecessors.

State of Stock: The stock remains stable at a low level. Potential growth of the stock from the 1984-86 year-classes has not occurred, likely because of large catches of juveniles from these cohorts by fisheries in the Regulatory Area, and because the TAC has been exceeded each year since 1984.

Forecast for 1995:

Option Basis	Predicted catch (1995)	Predicted SSB (1.1.1996)
$F_{0.1}$ =		
F_{93} =	No information avaialble.	
F_{max} =		

Recommendations: To rebuild this stock as fast as possible, no fishing should be permitted on yellowtail flounder in Div. 3LNO in 1995.

Special Comments: *Status quo* TACs in recent years have resulted in catches well beyond the TAC levels and have not resulted in any growth in stock size.

SUMMARY SHEET - Greenland Halibut in Division 0B and Divisions 1BCDEF (for Div.1A see separate Summary Sheet)

Source of Information: SCR Doc. 94/9, 18, 31, 42, 47, 59; SCS Doc. 94/5, 14, 15

Year	1987	1988	1989	1990	1991	1992	1993	1994
Recommended TAC[1]	25	25	25	25	25	25	25	25
Reported catches(Div. 0B+1B-F)	1	3	1	16	11[2]	13[2]	12[2]	
Non-reported catches						1		
Reported catches (Div.1A)[3]	8	7	7	8	10[2]	12[2]	12[2]	
Total landings (Div. 0B+1B-F)	1	3	1	16	11[2]	14[2]	12[2]	
Sp. stock biomass								
Recruitment (age)				No information available				
Mean F								

[1] Until 1994 TAC set for Subareas 0+1.
[2] Provisional.
[3] Only for information, see Summary Sheet on Greenland halibut in Division 1A.

Weights in '000 tons

Catches: Catches increased since 1990 mainly in Division 0B due to a new offshore trawl fishery. For catches in Div. 1A, see separate Summary Sheet.

Data and Assessment: Analytical assessment considered inappropriate due to lack of stock indicators and due to uncertainty of migrations in entire distribution area of Greenland halibut. Available survey data do not cover the entire area of distribution in Subareas 0-3. Survey estimates of biomass and abundance and CPUE series available.

Fishing Mortality: *Increased* in recent years, indication of a high level in 1993, but no exact value available.

Recruitment: No information available.

State of Stock: The survey biomass indices have declined since 1989 and the 1993 estimate for Div. 1BCD is the lowest on record. Abundance estimates also declined in the same period affecting the entire age range except for ages 2 and 3. Catch rates have declined significantly since 1991 in Div. 0B and Div. 1CD.

Forecast for 1995:

Option Basis	Predicted catch (1995)	Predicted SSB (1.1.1996)
$F_{0.1}$ =		
F_{93} =	No information available	
F_{max} =		

Recommendations: A separate TAC be established for the inshore areas of Div. 1A. The catch inshore in Div. 1A is expected to be around 12 000 tons in 1995.

Furthermore a separate TAC to be established combined *for all of Div. 0B and Div.* 1BCDEF.

The effort and catches throughout Subareas 0-3 in 1995 should be reduced compared to recent years.

For Div. 0B and Div. 1BCDEF combined, the TAC for 1995 be set below the offshore catch level of 11-15 000 tons seen in most recent years. This implies a TAC for 1995 be set below 11 000 tons.

Special Comments: There has been a significant amount of information collected which suggests that Greenland halibut in the Northern West Greenland fjords (Div. 1A) do not contribute to the spawning stock in the offshore areas in Davis Strait. There is very little fishery offshore in Div. 1A (less than 100 tons) and therefore tagging *cannot conclusively test a possible link* with Greenland halibut occurring inshore and offshore in Div. 1A.

There is no information available suggesting that Greenland halibut in Cumberland Sound and coastal areas of Baffin Island are isolated from the occurrence offshore in Div. 0B.

SUMMARY SHEET - Greenland Halibut in Division 1A (new unit, previously included in Subareas 0+1)

Source of Information: SCR Doc. 94/9, 18, 42, 59; SCS Doc. 94/5.

Year	1987	1988	1989	1990	1991	1992	1993	1994
Recommended TAC[1]								
Reported catches	8	7	7	8	10[2]	12[2]	12[2]	
Non-reported catches								
Total landings	8	7	7	8	10[2]	12[2]	12[2]	
Sp. stock biomass								
Recruitment (age)	No information available							
Mean F								

[1] Until 1994 TAC for Subareas 0+1.
[2] Provisional.

Weights in '000 tons

Catches: Catches increased somewhat during 1987-92. The fjord areas accounted for all catches. The fishery was conducted from small boats and dog sledges using gillnet and longlines.

Data and Assessment: Catch-at-age data are available for some years. Due to the non-migratory behaviour of Greenland halibut in the fjords, assessment will have to be made for each of the three fjord systems: Ilulissat, Ummannaq and Upernavik.

Fishing Mortality: Unknown.

Recruitment: No information available.

State of Stock: Catch compositions suggest stable stock components in the area. Stable catches since 1991.

Forecast for 1995:

Option Basis	Predicted catch (1995)	Predicted SSB (1.1.1996)
$F_{0.1}$ =		
F_{93} =	No information available	
F_{max} =		

Recommendations: A separate TAC be established for the inshore areas of Div. 1A.

Special Comments: There has been a significant amount of information collected which suggests that Greenland halibut in the northern West Greenland fjords (Div. 1A) do not contribute to the spawning stock in the offshore areas in Davis Strait. There is very little fishery offshore in Div. 1A (less than 100 tons) and therefore tagging cannot conclusively test a possible link with Greenland halibut occurring inshore and offshore in Div. 1A. There is ongoing research which will allow a re-evaluation after some few years. The catch inshore in Div. 1A is expected to be around 12 000 tons in 1995.

SUMMARY SHEET - Greenland Halibut in Subarea 2 and Divisions 3K and 3L

Source of Information: SCR Doc. 94/25, 29, 53, 57; SCS Doc. 94/13, 16.

Year	1987	1988	1989	1990	1991	1992	1993	1994
Recommended TAC	100	100	100	50	50	50	50	-
TAC[1]	100	100	100	50	50	50	50	25
Reported catches	31	19	19	27	35[2]	52[2]	53[2]	-
Non-reported catches				20	20-40	11	9	
Total landings	31	19	19	47	55-75[2,3]	63[2]	62[2,3]	
Sp. stock biomass	No information available							
Recruitment (age)								
Mean F								

[1] Established by Canada.
[2] Provisional.
[3] No reliable estimate of total landings.

Weights in '000 tons

Catches: Peaked at 38 500 tons in 1978 then declined to an average of 20 000 tons from 1985-89. Increased sharply in 1990 and 1991 mainly due to a developing fishery in the Regulatory Area of Div. 3LMN and has continued at high levels in 1992-93. Canadian catches were relatively stable from 1988-91 but declined considerably in 1992 and 1993 to their lowest level since the fishery began in the early-1960s.

Data and Assessment: Analytical assessments considered unacceptable until migratory patterns and stock structure are fully understood. Catch-rate data are available, however, research vessel surveys continue to give the more important indices of abundance for the stock distributed in the survey area.

Fishing Mortality: Not known precisely, but believed to be high in recent years.

Recruitment: The 1990 and 1991 year-classes estimated to be better than average in the 1993 survey.

State of Stock: The survey results in 1991 and 1992 suggest that the year-classes of 1984-86 had declined rapidly to very low numbers in the survey area of Div. 2J+3KL.

Most of the indices of abundance for 1993 indicated a continued decline of older fish throughout Subareas 2 and 3.

Forecast for 1995:

Option Basis	Predicted catch (1995)	Predicted SSB (1.1.1996)
$F_{0.1}$ =	No information available	
F_{93} =		
F_{max} =		

Recommendations: The effort and catches throughout Subareas 0-3 in 1995 should be reduced compared to recent years.

Any catch level in Subareas 2-3 above 40 000 tons for 1995 (*status quo* prediction including the catches of non-Contracting Parties) will not be adequate to restrict the fishery. Therefore, a reduction in effort requires a reduction in catch below that figure (see Special Comments below).

Special Comments: Concern was expressed that based on some of the available stock indicators the catch in 1995 should be substantially lower to halt the decreasing biomass trend.

SUMMARY SHEET - Roundnose Grenadier in Subareas 0 and 1

Source of Information: SCR Doc. 94/31; SCS Doc. 94/15.

Year	1987	1988	1989	1990	1991	1992	1993	1994
Recommended TAC	8	8	8	8	8	8	8	8
Agreed TAC	8	8	8	8	8	8	8	
Reported catches	0.38	0.52	0.08	0.24	0.16[1]	0.19[1]	0.1[1]	
Sp. stock biomass								
Recruitment (age)				No information available.				
Mean F								

[1] Provisional.

Weights in '000 tons

Catches: Since about 1980, landings have been only as by-catch in the Greenland halibut fishery.

Data and Assessment: No catch-at-age data available and no catch and effort data available for the recent period. Assessment is not possible at present.

Fishing Mortality: No estimate available.

Recruitment: No estimate available.

State of Stock: Trawlable biomasses in Div. 1CD estimated from the joint Greenland/Japan surveys have since 1987 fluctuated between 5 900 tons and 45 800 tons. From 1992 to 1993, the estimate decreased from 40 200 tons to 8 200 tons. The surveys did not cover all Divisions and waters deeper than 1 500 m, where roundnose grenadier is known to be distributed. It is, therefore, at present not possible to evaluate the stock.

Forecast for 1995:

Option Basis	Predicted catch (1995)	Predicted SSB (1.1.1996)
$F_{0.1}$ =		
F_{93} =	No information available.	
F_{max} =		

Recommendations: TAC for roundnose grenadier in Subareas 0+1 in 1995 to remain at 8 000 tons.

Special Comments:

SUMMARY SHEET - Roundnose Grenadier in Subareas 2 and 3 (with some comments on Roughhead grenadier)

Source of Information: SCR Doc. 94/23, 29, 48; SCS Doc. 94/3, 13.

Year	1987	1988	1989	1990	1991	1992	1993	1994
Recommended TAC	11	11	11	11	11	11	11	5
Agreed TAC	11	11	11	11	11	11	11	3
Reported catches[1]	8	6	5	4	5[2,3]	5[2]	10[2]	
Non-reported catches								
Total landings[1]	8	6	5	4	9-14[2,3]	5[2]	10[2]	
Revised landings[4]	7	5	5	1	5-10[3]	3[2]	4[2]	
Sp. stock biomass								
Recruitment (age)				No information available				
Mean F								

[1] Original estimates as reported to NAFO.
[2] Provisional.
[3] No reliable estimate of total landings.
[4] Revised estimates based on data in SCS 94/13 and SCR Doc. 94/29.

Weights in '000 tons

Catches: Prior to 1979, catches averaged about 26 000 tons but, based on revised estimates of catches in the Regulatory Area, have since declined to an average of about 4 500 tons. In 1991 the Council could not precisely estimate the actual catch but determined it to be within the range of 9 000-14 000 tons. The revised estimates lower this to between 5 000-10 000 tons. Since about 1989, catches from the 'traditional' fishery have steadily declined and were zero in 1993. Revised estimates indicate catches from the Regulatory Area began to increase in 1992 due to by-catch by EU-Spain in the Greenland halibut fishery. The catches previously reported by EU-Portugal to be roundnose grenadier have been re-identified as roughhead grenadier, and about 50% of the catch of EU-Spain previously reported as roundnose is now believed to have been roughhead.

Data and Assessment: Results of the annual Canadian autumn stratified-random survey in 1993 once again indicated the area of greatest concentration to be in Div. 3K at about 51°N, coinciding with the area of the 'traditional' fishery. Results of deepwater surveys by Canada in 1991 and 1994 also indicated that the highest catches were in this same area, in depths of 1 000- 1 500 m. Trawlable biomass estimates in Div. 3K did not change from 1991 to 1994, but estimates for Div. 3LM declined somewhat. The lowest estimated biomass was in Div. 3N. The estimated proportion of roundnose grenadier to roughhead grenadier from the survey in Div. 3N (17%) was about the same as the estimated proportion of roundnose to roughhead grenadier in the EU-Spain and EU-Portugal fisheries (20%) in recent years.

Fishing Mortality: No estimate available.

Recruitment: No estimate available.

State of Stock: Not possible to evaluate precisely. Previous assessments have concluded that the resource has declined in the 'traditional' fishing area inside the Canadian zone, although there was no change in the estimated biomass from surveys in Div. 3K in 1991 and 1994. It is not possible to evaluate the status of the resource in the Regulatory Area.

Forecast for 1995: No forecast.

Option Basis	Predicted catch (1995)	Predicted SSB (1.1.1996)
$F_{0.1}$ =		
F_{93} =	No information available	
F_{max} =		

Recommendations: The current TAC level for roundnose grenadier in Subareas 2 and 3 of 3 000 tons be continued in 1995 as a precautionary measure.

Special Comments: The current TAC for roundnose grenadier in the Canadian zone of SA 2+3 (3 000 tons) is about 15% of the estimated trawlable biomass for Div. 3K alone. If this quota is taken, fishing mortality should not be excessive. In the Regulatory Area, the average catch from 1991 to 1993 represents about 25% of the trawlable biomass for this area. Exploitation has been greater in the Regulatory Area compared to the 'traditional' area in recent years.

Because of efforts by EU-Spain and EU-Portugal it is now possible to determine the proportion of roundnose grenadier and roughhead grenadier in the catches of these countries in the Regulatory Area previously reported as roundnose grenadier. These indicate much lower catches of roundnose grenadier than previously believed. Catches of roughhead grenadier have exceeded those of roundnose since 1990 in the Regulatory Area.

SUMMARY SHEET - Capelin in Divisions 3N and 30

Source of Information: SCR Doc. 94/14, 22; SCS Doc. 94/1.

Year	1987	1988	1989	1990	1991	1992	1993	1994
Recommended TAC	10	10	28	30	30	30	0	0
Agreed TAC	10	15	28	30	30	30	0	0
Reported catches	1	7	9	25	+[1]	+[1]	0	
Non-reported catches								
Total landings	1	7	9	25	+	+	0	
Sp. stock biomass[2]	273	560	28	-	-	-	130	
Recruitment (age 1)	No information available							
Mean F								

[1] Provisional.
[2] In some years, these were averages of USSR and Canadian acoustic surveys and in other years only Canadian estimates were available. These are estimates of mature biomass.

Weights in '000 tons

Catches: Peak catch in 1975 of 132 000 tons. Fishery was closed during 1979-86 and in 1993.

Data and Assessment: Acoustic surveys of the spawning stock through 1981-89 and 1993. Spawning stock estimate expected from summer 1994 survey.

Fishing Mortality: Exploitation considered to be less than 10% of long-term mean spawning biomass.

Recruitment: No estimates of recruitment at age 2.

State of Stock: USSR acoustic surveys during 1975-77 indicated mean biomass of 912 000 tons. Mean stock size in 1981-89 was about 300 000 tons. Biomass estimates in 1991 and 1992 were low, but surveys may have been too early. Some signs of improvement in 1993.

Forecast for 1995: No projections.

Option Basis	Predicted catch (1995)	Predicted SSB (1.1.1996)
$F_{0.1}$ =	No information available	
F_{93} =		
F_{max} =		

Recommendations: No directed capelin fishery be allowed during 1995 in Div. 3N and 3O. If results from the Russian survey in 1994 are available for the September 1994 Meeting, the status of the stock should be re-evaluated.

Special Comments: Concern was expressed about apparent low abundance levels and their impacts on future recruitment and predator stocks.

SUMMARY SHEET - Squid in Subareas 3 and 4

Source of Information: SCR 94/37; SCS Doc. 94/1, 12.

Year	1987	1988	1989	1990	1991	1992	1993	1994
Recommended TAC	150	-	-	-	-	-	-	-
Agreed TAC	150	150	150	150	150	150	150	150
Reported catches								
Non-reported catches								
Total landings	2	1	7	11	4[1]	2[1]	3[1]	
Sp. stock biomass								
Recruitment (age)				No information available				
Mean F								

[1] Provisional.

Weights in '000 tons

Catches: Increased dramatically during 1970s from under 10 000 tons in first half to 162 000 tons in 1979, after that declined to less than 2 000 tons during 1983-88. Increased in 1989 and 1990, but has declined since.

Data and Assessment: Limited sampling data from SA 3.

Fishing Mortality: No information available.

Recruitment: No information available.

State of Stock: Dependent on one year-class only.

Forecast for 1995:

Option Basis	Predicted catch (1995)	Predicted SSB (1.1.1996)
$F_{0.1}$ =		
F_{93} =	No information available	
F_{max} =		

Recommendations: No advice possible.

Special Comments: No advice possible without up-to-date information in relation to assessment on squid, especially for recruitment.

6. Responses to the Fisheries Commission

The following responses to the questions by the Fisheries Commission were reviewed and **approved** by the Scientific Council.

a) Cod in Divisions 2J, 3K and 3L (SCR Doc. 94/41)

The Scientific Council was again requested (FC Doc. 93/18) to: *provide information, if available, on the stock separation in Div. 2J and 3KL and the proportion of the biomass of the cod stock in Div. 3L in the Regulatory area and a projection if possible of the proportion likely to be available in the Regulatory Area in future years. Information was also requested on the age composition of that portion of the stock occurring in the Regulatory Area.*

The stock separation issue has been reviewed previously (NAFO Sci. Coun., Rep. 1986) and it was then concluded that it was appropriate to assess cod in Div. 2J, 3K and 3L as a single stock complex. There is currently no additional information to change this conclusion. The general issue of stock definition is being addressed by research using a suite of genetic techniques (nuclear DNA gene probes). It is hoped these studies will lead to a better understanding of the Div. 2J and 3KL stock complex.

Estimates of the proportion of the cod biomass in Div. 3L in the Regulatory area were updated to include the 1993 research vessel survey data. The results for autumn surveys showed biomass in the Regulatory Area (6.0%) to be the highest since 1982. The spring survey series continued to show an increasing trend in the percentage of biomass in the Regulatory Area, with consecutive time series highs of 10.1%, 16.1% and 40.1% in 1991, 1992 and 1993, respectively. The results from the survey series used are as follows:

Season RV survey conducted	Years RV survey conducted	Range of % of Div. 3L biomass occurring in the Regulatory Area (1993 values in brackets)	Average
Winter	1985-86	23.8-26.8	25.3
Spring	1977-93	0.4-40.1 (40.1)	6.8
Autumn	1981-93	0.5-7.7 (6.0)	3.1

The proportions observed are estimates for the months in which the surveys were conducted and may not represent distributions in non-surveyed months. Although only two winter surveys have been conducted, the proportion of biomass in the Regulatory Area at that time appeared to be substantially higher than at other times.

Results of the autumn surveys conducted in all three Divisions (2J, 3K and 3L) by Canada from 1981 to 1992, showed that the proportion of the cod in the Regulatory Area at that time of year was less than 1%, on average, of the total Div. 2J and 3KL biomass. This percentage ranged from 0.1% to a high of 1.5% . In 1993 with the stock at an extremely low level the portion in the Regulatory Area was at a high of 5.2%. The average breakdown of biomass by Division was as follows:

Division	Mean relative proportion of Div. 2J and 3KL biomass (%) 1981-1993	1993 Autumn (%)
2J	31	8
3K	33	23
3L	36	69

Survey data indicated that the proportion of total stock biomass occurring in the Regulatory Area was less than 10% in winter, and less than 5% on average in spring and autumn. In recent years there has been an increasing trend in the portion of the biomass in the Regulatory Area.

Age compositions derived from spring and autumn surveys in Div. 3L indicated that for most years there was a higher proportion of younger cod in the Regulatory Area. Estimates for winter surveys showed that age compositions were similar in both areas. Cod age compositions from autumn research vessel surveys for Div. 2J, 3K and 3L combined were similar to those which occurred in Div. 3L inside the 200-mile fishing zone.

b) **Mesh Size in the Redfish Fishery**

The Russian mesh size study described in November 1993 (NAFO Sci. Coun. Rep., 1993) had not yet been carried out and there was therefore no information available for consideration by the Council.

c) **Establish Minimum Sizes for Product Corresponding to Minimum Landing Sizes**

The Fisheries Commission requested (FC Doc. 93/18) the Scientific Council to investigate:

i) *With reasonable levels of variance, are there specific numeric values that can be established for processed fish that would be the equivalent of the current minimum fish sizes (round length).*

ii) *Is there a reasonable consistent relationship between total body length and head and tail length that could be used by inspectors to establish if vessels are processing fish below current minimum fish sizes. If so, what would these lengths be for gutted, head-off/gutted, head-off, tail-off and split product forms for cod, redfish, American plaice, yellowtail, witch and Greenland halibut.*

The Council finds that such information may be more easily obtained through direct contact with the fishing industry or possibly through the observer program, instead of through the fisheries laboratories, since such data are not usually collected by the fisheries research laboratories. The Council further discussed the possible use of the already established conversion factors.

It is noted that conversion factors relate the product weight to the live fresh weight of the fish, and live fresh weight can be related to the length of the fish through a length-weight relationship.

The Council observed that conversion factors have been established for statistical purposes. These factors vary between countries because of, among other things, different production technologies. These factors have been established for different species and different products, and world-wide compilations have been published by FAO (UN). These factors are average values applicable for raising the total production in a country to the corresponding live fresh weight. Within these average values, there are substantial variations with fish size, seasons, fishing grounds, technology and between individual batches. There are also some variation between years.

Also, an average length-weight relationship can usually be established with great precision for a specific species from a specific area in a season. Here too there is individual variance around the mean relationship.

Consequently, the Council observes that individual back calculated live lengths from a product are subject to considerable uncertainty, and the Council doubts that such relationships could be useful for inspection purposes. For example, even a very small head-off tail-off split product cod may be the result of a particular mal-adjusted machine.

If these data need to be obtained, it would require a comprehensive survey involving data for each factory vessel, for different seasons and for fish originating from different fishing grounds. Informal contacts with the industry suggests that such detailed data are considered sensitive information, important to the competitiveness of the enterprise and therefore not easily accessible. The Council does not consider that the compilation of this information will be cost effective in establishing a legal tool for the fishing inspectors.

d) **Minimum Landing Sizes for Greenland Halibut and Flatfishes**

The Fisheries Commission requested (FC Doc. 93/18) the Scientific Council to: *review appropriate minimum landing sizes for Greenland halibut and flatfishes.*

The Council noted it had advised on minimum landing sizes for American plaice (25-28 cm) and yellowtail flounder (25-28 cm) in 1992 (NAFO Sci. Coun. Rep., 1992, p. 71).

It was also noted that available data in laboratories have not yet been analyzed and presented to the Scientific Council. The Council agreed to defer its discussions on this subject to its September 1994 meeting.

7. Responses to Requests by Canada and Denmark (Greenland)

With respect to Greenland halibut in Subareas 0 and 1, subject to concurrence of Denmark (Greenland) as regards to Subarea 1, **Canada** requested the Scientific Council to: *provide an overall assessment of the total stock throughout its range and comment on its management.*

The Scientific Council was not able to provide an analytical assessment of the total stock, but the available information indicated that the stock was overexploited; for further comments see the prognosis section for Greenland halibut in the STACFIS Report, Appendix I, Section 15, particularly point 1, 2, 3, 5 and 6.

The two following recommendations are relevant in this context:

- Separate TACs be maintained for different areas of the distribution of Greenland halibut.
- The effort and catches throughout Subareas 0-3 in 1995 should be reduced compared to recent years.

With respect to Greenland halibut in Subareas 0 and 1, **Denmark (on behalf of Greenland)** requested that the Scientific Council provide information on:

a) *Analysis of the existing information on stock delimitation in Subareas 0, 1, 2 and 3,*
b) *Allocation of TACs to appropriate Subareas (within Subareas 0 and 1), and*
c) *Allocation of the TAC for Subarea 1 into inshore and offshore areas.*

Concerning a) the Council's response is given in the prognosis section for Greenland halibut in the STACFIS Report, Appendix I, Section 15, particularly points 1, 2, 7 and 8.

Concerning b) the Council noted STACFIS updated the available information which may be used in an allocation of the TAC between Subareas 0 and 1. This update confirmed the Council comments of 1993 (NAFO Sci. Coun. Rep., 1993, p. 104):

> "Catch and effort information by month and Divisions were available but these were not necessarily indicative of the stock distribution."
>
> "Based on survey information from Subarea 0 and 1 in 1987, 1988 and 1990 the offshore biomass was distributed approximately 50:50 between these two Subareas". The biomass results are presented below:

Biomass estimates (000' tons) from Greenland/Japanese surveys and USSR(RUS)/GDR(FRG) surveys for the years 1987-93 in Subareas 0+1.

Year	USSR(RUS)/GDR(FRG) Surveys		Greenland/Japan Surveys		Total
	0B	1BCD	1ABCD[1]	1BCD	0B+1ABCD
1987	37	56	58[2]	54[2]	95
1988	55	47	57	53	112
1989	79	-	-	63[3]	-
1990	72	88	56[4]	53[4]	128
1991	46	-	79	77	125
1992	38	-	64	62	102
1993	-	-	-	38	-

[1] Div. 1A south of 70°N.
[2] In 1987 the survey did not cover the depth stratum 1 000-1 500 m.
[3] Estimate only for Div. 1CD.
[4] Average values of two surveys.
- no survey.

Concerning c) the Council stated in 1993 (NAFO Sci. Coun. Rep., 1993, p. 104):

"No estimate on the inshore biomass in Subarea 1 was available to STACFIS,..".

Also in 1994 no inshore biomass estimates were provided for this component. The Council was therefore unable to provide an answer. However, further information is given in the prognosis section for Greenland halibut in the STACFIS Report, Appendix I, Section 15, points 7, 8 and 10.

8. Ageing Techniques

The Council noted that in accordance with recent recommendations, information on the agreed manual on the methodology on silver hake ageing would be documented for the September 1994 Meeting. It was noted the additional work on the nucleotide method has been discontinued because it was unsuccessful for technical reasons.

The otolith exchange programs for American plaice and Greenland halibut were continuing, while there was no report on new validation studies.

9. Gear Selectivity

Investigations on reducing the discard of small shrimp and juvenile fish in the shrimp fishery have been ongoing since 1991 jointly by Denmark, Greenland, Iceland, Faroe Islands, Norway and Sweden. In 1993 a grid device was tested in a commercial shrimp trawl. So far, the device is not adoptable for the fishery due to loss of large shrimps. Additionally, selectivity parameters of a commercial shrimp trawl from Greenland were estimated based on alternate hauls with different cod-end mesh sizes.

The Council noted the ongoing work on prevention of catches of small redfish in the shrimp fisheries in Subarea 1, and noted that the results of this work may be also relevant for other shrimp fisheries.

10. Relation Between Acoustic Biomass Estimates and Other Methods

Although no studies were presented, the importance of studies of the relationship between acoustic biomass estimates and other methods for biomass estimation were recognized by the Council. However, the problem of comparability of results based on acoustic surveys and results based on surveys using trawl or longline, etc., has not been resolved yet. Therefore, the Council encourages that research be undertaken.

Concerning surveys combining estimates from trawl fishery and estimates from acoustic measurements, the Council endorsed STACFIS point of view and the **recommendation** that information be provided on bottom trawl and pelagic component, the vertical and horizontal distribution as determined from the trawl-acoustic surveys, and more details on the location or concentration of fish species in combined trawl acoustic surveys.

III. RESEARCH COORDINATION (see STACREC report, App. II)

1. Fishery Statistics

a) Progress Report on Secretariat Activities in 1993/94

The Council reiterated STACREC concerns on the delays in receipt of national STATLANT 21B reports for 1991 and 1992. These delays continue to affect assessments and cause delays in the publication of the Statistical Bulletins.

The Council urged STACREC to pursue the acquisition of data available in reports and working papers of other Standing Committees, namely STACTIC and STACFAC. These data should be distributed to National Representatives and Designated Experts and evaluated annually as to their relevance in the assessment process.

The Council noted that recent volumes of the *NAFO Statistical Bulletins* had been published without data from important components EU-France (M) and France (SP). The Council agreed with the STACREC **recommendation** to publish the bulletins but that efforts be made to obtain the EU-France data to complete the database and update the bulletins.

The Council was pleased on the progress made regarding the misallocation of catches of roundnose and roughhead grenadier. Documentation was tabled which allow a more accurate partitioning of grenadier catches of EU-Spain and EU-Portugal. It was agreed that these corrected data be confirmed by the Secretariat from the statistical officers of EU-Spain and EU-Portugal.

b) **Deadlines for the Submission of STATLANT 21A and 21B Data**

The Council noted there may have been some uncertainties regarding deadlines for submission of STATLANT data as a result of STACREC discussions and recommendations in 1993. The Council clarified that **Rule 4.4** remains in effect for the submission of STATLANT data, and the deadlines are 15 May and 30 June for STATLANT 21A and 21B, respectively.

c) **Preparation for CWP 16th Session**

The Council noted that the Assistant Executive Secretary had attended, at the invitation of the FAO, an FAO sponsored *ad hoc* consultation of CWP participating agencies in La Jolla, California. The role of CWP in relation to high seas fisheries statistics was discussed. The report of that meeting is available at the Secretariat.

The Council was pleased that the Assistant Executive Secretary had been invited by FAO to investigate discrepancies between the NAFO and FAO databases. It noted that discrepancies had been addressed and a process put in place to ensure the compatibility of the NAFO and FAO databases for the STATLANT 21 area.

The Council noted that an *ad hoc* consultation of CWP participating agencies was being held in place of the Sixteenth Session of CWP in July 1994. The agenda would include discussions on possible revisions to CWP statutes and rules of procedure. The Council noted that consultation with NAFO Contracting Parties indicated that a clear picture of the role of CWP was necessary before discussions were initiated on revision of statutes. The Council felt these issues would be best dealt with by the General Council, as any attending representative would have to have a clear mandate on policy making.

The Council noted that the Assistant Executive Secretary would not attend the July meeting but reconfirmed that attendees (STACREC Chairman, C.A.Bishop; Assistant Executive Secretary, T. Amaratunga, and the representative from Spain, E. de Cardenas) slated to attend the Sixteenth Session of CWP will be **recommended** to attend that meeting, now scheduled for February 1995 in Madrid, Spain.

2. **Biological Sampling**

The Council noted the Provisional List of Biological Sampling for 1992 was prepared by the Secretariat (SCS Doc. 94/8). Also available data from 1993 commercial fisheries for stock assessments were tabulated and the national representatives reported their sampling program for the 1993/94 commercial fisheries, at the STACREC meeting.

3. **Biological Surveys**

a) **Review of Stratification Scheme**

The Council noted that a document was presented (SCR Doc. 94/43) that outlined changes to the stratification used by Canada for stratified-random groundfish surveys in Subareas 2+3. The changes included major revisions to the existing strata by using new, more accurate charts in Div. 2J and 3K, and minor changes to existing strata in Div. 3O and 3P. In addition to these changes, the stratification scheme was extended to 800 fathoms in Div. 3L, 3M, 3N, 3O and 3P, and strata were created in the shoreward area of Placentia Bay, Newfoundland.

b) **Coordination of Surveys**

The Council noted that EU-Spain indicated that a survey in Div. 3M, 3L, 3N and 3O in depths between 700 and 2 000 meters would be proposed to EU, and Greenland and Japan planned to conduct a survey for Greenland halibut in Subarea 1 during 1994 in depths from 400 to 1500 meters. The Council hoped these surveys can be coordinated with interested countries.

4. **Data Necessary for Assessments**

The Council was concerned over the lack of biological data from fisheries in the Regulatory Area by non-Contracting Parties, as these fisheries catch significant amounts of various species.

The Council agreed with STACREC that sampling of non-traditional species may become more important as traditional species decline.

5. **Other Matters**

The Council noted STACREC concerns over the lack of an updated document on worldwide conversion factors. It noted that FAO usually updated their compilations periodically, about every three years, but the compilation of the most recent document had been delayed. The Council endorsed the **recommendation** that the Secretariat request documentation detailing any revisions of conversion factors used in STATLANT Area 21.

The Council was informed of the extension of the Pilot Observer Program, and endorsed the STACREC **recommendation** that it be determined if data from this program can be made available in time for annual June assessment meeting of the Council.

The Council noted STACREC concern over the lack of adequate time to review non-assessment documents at this meeting, and hoped that changes to the scheduling and structure of the Scientific Council would alleviate this problem in the future.

IV. PUBLICATIONS (see STACPUB report, App. III)

1. **Review of Scientific Publications**

The Council was pleased to note Journal Vol. 15 containing an invitational paper on "Decapod Crustacean Larvae from Ungava Bay" was published in December 1993. Further it was noted that Journal Vol. 16 containing miscellaneous papers and Vol. 17, containing papers presented at the November 1990 Canada-USSR Meeting on Capelin were in the final stages of preparation and expected to be completed by mid-1994.

The Council also noted Studies No. 19, containing 8 miscellaneous papers was published in October 1993, and Studies No. 20, containing 7 miscellaneous papers was published in February 1994.

The Council was pleased that 8 papers dealing with Northern Cod presented in June 1993 were submitted to the Secretariat to be published in a single issue of Studies by the end of 1994.

The Council noted *NAFO Statistical Bulletin*, Vol 40 for 1990 was published in February 1994 without EU-France Metropolitan and France (St. Pierre and Miquelon) data and expressed its regrets that these data are still not available.

The Council was pleased that the *Index of Journal and Studies for 1980-93* had been published in February 1994.

2. **Production Costs and Revenues for Scientific Council Publications**

a) **Publication Costs and Revenues**

The Council noted that there was no significant departures from previous years' production and revenue costs. Further the Council was pleased that the ongoing review of the mailing list and a new billing procedure introduced by the Secretariat had resulted in a decrease in number of copies printed and mailed out.

b) **Print Pages at the Secretariat**

The Council was pleased with the substantial accomplishment in regard to avoiding double printing of documents. It is important that meeting participants are requested to submit finalized documents in advance of the meetings and also participants no longer have to be mailed copies of documents they have received at meetings.

3. **Promotion and Distribution of Scientific Publications**

The Council noted that initiatives were taken by STACPUB to promote invitational papers. It was also agreed that topics of broad interest should be considered for NAFO Special Sessions and the resulting publication as a possible means to enhance the promotion of the Journal.

4. **Editorial Matters**

The Council was pleased to note that a total of 448 papers had been nominated by STACPUB since 1980 and a total of 357 papers had been published in the Journal (166) and Studies (191). Of the 12 papers nominated at the June 1993 Meeting, 7 papers had been submitted, and in addition, of the 25 papers presented at the NAFO 1993 Special Session, 12 papers had been submitted.

5. **Papers for Possible Publication**

a) **Procedures for STACPUB Review**

The Council noted that concern had been raised regarding procedures of STACPUB review and nomination of papers, and STACPUB had a detailed discussion on this matter. The Council agreed that the introduction of a questionnaire to authors on whether their papers should be considered for publication was useful. The Council further agreed that the role of STACPUB was to act as a preliminary review board with the opportunity to make suggestions for improvements, but that the sole responsibility for the quality of the paper lies with the author.

The Council noted a comment by STACPUB that some authors do not differentiate between Journal and Studies, and stressed that authors need to put more effort into evaluation of the content of the paper and the distinction between Journal and Studies.

b) **Review of Contributions to the 1994 Meetings**

The Council was encouraged by the progress made by STACPUB in the review of SCR documents in consideration of their nomination for publication, particularly the Council welcomed the new approach of providing comments to authors on how to improve their submissions.

The Council noted 13 papers were nominated to invite authors to submit revised papers.

V. RULES OF PROCEDURE

1. **Establishment of a Standing Committee on Environment**

In its considerations of the reorganization of the Scientific Council, it was noted that there has been an increasing awareness of the importance of the information considered by the Environmental Subcommittee of STACFIS, and the relevance of the information to the fisheries considered by the Council. The Council accordingly agreed a new Standing Committee was needed to replace the Environmental Subcommittee.

During the Council meeting on 8 June 1994, the title of 'The Standing Committee on Fisheries and Environment', with the acronym STACFEN, as proposed by the Executive Committee was **adopted**.

At its meeting of 15 June 1994, the Council considered the proposed new Rules of Procedure prepared by the Chairman. Noting the Council had a quorum of 10 Contracting Parties (6 present and 4 proxy votes carried by the Executive Secretary), in accordance with Article X.2 of the Convention, the Council **adopted** the new Rules of Procedure for STACFEN by a unanimous vote. It was noted that this **new Rule 5.1d)** for STACFEN was contained in the slate of Rules of Procedure presented in SCS Doc. 94/17, Serial No. N2418 (see Annex 1).

2. **Restructuring Working Arrangements**

In its considerations of the reorganization of the Scientific Council, the Chairman in consultation with the Executive Committee proposed changes to the work arrangements of STACFIS and STACREC while no changes were envisaged to STACPUB. It was recognized that new Rules of Procedure were needed to address changes.

At its meeting of 15 June 1994, the Council considered the proposed new Rules of Procedure prepared by the Chairman. Having agreed to the text as presented in SCS Doc. 94/17, Serial No. 2418 for Rule 5.1, the Chairman called for a vote in accordance with Article X.2 of the Convention. The **new Rule 5.1** of the Rules of Procedure of the Scientific Council were **adopted** by a unanimous vote (see Annex 1, page 54).

VI. COLLABORATION WITH OTHER ORGANIZATIONS

1. **Joint ICES/NAFO Working Group on Harp and Hooded Seals**

At the Council meeting on 17 June 1994, the Chairman announced that a request for scientific advice on harp and hooded seals had just been received from Denmark (on behalf of Faroe Islands and Greenland) (see Annex 2). Noting advice would have to be provided by the Council at the Annual Meeting of September 1995, the Scientific Council agreed a request would be forwarded to the ICES/NAFO Working Group on Harp and Hooded Seals to address this request. The Council proposed that this request should be addressed immediately prior to the 7-21 June 1995 Meeting of the Scientific Council. It was hoped the Working Group would schedule its meeting for 5-7 June 1995, in order that some scientists from the Council may attend the meeting.

2. **Sixteenth Session of CWP and Proposed *Ad Hoc* Consultation**

The Council noted the Sixteenth Session of the CWP had been postponed to early-1995 in Madrid, Spain, and reconfirmed that representatives of the Scientific Council **recommended** during the September 1993 Meeting viz. STACREC Chairman, C. A. Bishop (Canada), Assistant Executive Secretary, T. Amaratunga, and the representative from Spain, E. de Cardenas, would attend the Sixteenth Session.

The Council noted that an *ad hoc* consultation was now scheduled for July 1994 in Madrid, Spain. The agenda of this consultation proposed a discussion of restructuring the CWP, including discussions of statutes and rules of procedure for CWP. The current structure of informal consultations among the international agencies conducted under CWP has worked well and the Council was concerned that a more formal structure could hamper the statistical activities of NAFO. It may therefore be desirable that the views of NAFO be presented at the *ad-hoc* meeting in Madrid in July 1994. In this light the Council advised the Executive Secretary to discuss this matter with the President with regards to the position of NAFO and possible participation.

VII. ARRANGEMENTS FOR SPECIAL SESSIONS

1. **Special Session of September 1994**

The Council accepted the revised plans proposed by the co-conveners, and the discussions reported by the Environmental Subcommittee. The Council confirmed that the Symposium on 'Impact of Anomalous Oceanographic Conditions at the Beginning of the 1990s in the Northwest Atlantic on the Distribution and Behaviour of Marine Life' will be on 15 and 16 September 1994 (not 14-16 September as initially proposed), at NAFO Headquarters, Dartmouth, Nova Scotia. It was noted the papers would include a 10-year review of environmental conditions.

2. **Special Session of September 1995**

The Council was pleased that the first announcement, as reviewed by the Council, will be circulated shortly. Noting special interests expressed by the Contracting Parties Canada and Denmark (Greenland), the Council was hopeful this joint NAFO/ICES Symposium on 'The Role of Marine Mammals in the Ecosystem' will attract significant interest and diverse contributions.

3. **Special Session of September 1996**

The Council decided that a symposium should be held in September 1996, and agreed on the working title 'What Future for Capture Fisheries in the Northwest Atlantic'. The tentative dates and place are 4-6 September 1996, Dartmouth, Nova Scotia, Canada. The Chairman of the Council undertook to form a Steering Committee to prepare for this Symposium, which is likely to be of significant international interest, and report on the progress at the September 1994 meeting.

The objectives of this symposium were stated as:

- Assess the future of capture fisheries in the Northwest Atlantic on the 25-50 year scale (first half of the 21st century)
- Discuss appropriate management strategies in the same time scale to maintain viable fisheries
- Encourage dialogue between managers (e.g. NAFO Fisheries Commission) and scientists (e.g. NAFO Scientific Council)

It was agreed that the specification of the objectives would be critical to the success of such a symposium. It was recognized that two different approaches could be taken: either aim at a general worldwide rather philosophical discussion or a more area specific discussion.

VIII. FUTURE SCIENTIFIC COUNCIL MEETINGS

1. **Annual Meeting and Special Session in September 1994**

The Scientific Council would next meet at the Annual Meeting of NAFO during 19-23 September 1994 at the Holiday Inn, Dartmouth, Nova Scotia, Canada. At this meeting the Council will address the assessment of shrimp on the Flemish Cap. At this meeting it will also discuss the shrimp fishing activities in Div. 3LN by the Faroese, re-evaluate the capelin stock in Div. 3NO if Russian survey results are available. The Council will also review the computer hardware and software needs for the June assessment meetings.

This meeting would be preceded by the symposium on 'Impact of Anomalous Oceanographic Conditions at the Beginning of the 1990s in the Northwest Atlantic on the Distribution and Behaviour of Marine Life', during 15-16 September 1994 (revised from the original 14-16 September) at NAFO Headquarters, Dartmouth, Nova Scotia, Canada.

2. **Special Meeting on Shrimp Assessment in November 1994**

The Council proposed a special meeting to conduct assessments of shrimp in Subareas 0+1 and in Denmark Strait be held at NAFO Headquarters, Dartmouth, Nova Scotia during 17-20 November 1994.

3. ***Scientific Council Meeting in June 1995***

The Council agreed this meeting be scheduled for 7-21 June 1995.

4. **Annual Meeting and Special Session in September 1995**

The Council noted it would meet during the Annual Meeting scheduled for 11-15 September 1995. This would be preceded by the Joint NAFO/ICES symposium on "The Role of Marine Mammals in the Ecosystem" during 6-8 September 1995.

IX. NOMINATION AND ELECTION OF OFFICERS

The Chairman's proposal (8 June 1994) to appoint a Nomination Committee composed of D. B. Atkinson (Canada) and A. Vazquez (EU-Spain) was accepted by the Council. On 22 June the Chairman requested the Nominating Committee to present its proposal for the Chairmanship of STACFIS. The Committee reported that after consultations with representatives it was ready to nominate W. B. Brodie (Canada). There being no further nominations, and noting that the appointment was for a two-year term beginning at the end of the September 1994 Annual Meeting, the Chairman called for an election and W. B. Brodie was elected by unanimous consent.

In connection with the establishment of STACFEN, M. Stein (EU-Germany) had been elected on 15 June 1994. The Chairman noted he takes office on the 1st January 1995 for a two-year term ending at the closure of the September 1996 Annual Meeting.

X. OTHER MATTERS

1. Space Requirements for June Meetings

This 8-22 June 1994 Meeting of the Scientific Council was held at Keddy's Dartmouth Inn. The Council considered the space and facilities available were a major improvement compared to those available at NAFO Headquarters. The computer room and extra rooms available for small *ad hoc* meetings were constantly occupied. This permitted the Chairmen to have a better overview of the progress of the work and the scientists better opportunities for individual work and small informal discussions. The Council concluded that the space provided was adequate and necessary for its June meeting. The Council therefore conveys to the General Council that space and facilities of this nature should be considered for future June meetings.

2. Hardware and Software Required for the June Meeting

The hardware made available for the scientists for the June meeting this year included three IBM compatible PCs and one matrix printer. Two of the PCs were equipped with 5.25" diskette units only while all portable PCs brought by many participants only used 3.5" diskettes. The usefulness of these two PCs was therefore limited. The matrix printer was rather slow, and the Council agreed that if it would be possible to make laser printers available, it would speed up the work of the scientists and it would avoid unnecessary disturbances of the work of the Secretariat staff. The software available on the PCs was also limited and many print jobs were made by hooking the portable PC directly to the matrix printer. A modem link via the telephone was established and worked well. The Council felt it could best accomplish its work if 1-2 PCs with some software (WP 5.1 and Spreadsheets programs - as used by most of the assessment scientists) and laser printers could be made available for the June 1995 Meeting. The Council agreed it would further discuss its needs during its meeting in September 1994.

3. By-catch of Redfish in Shrimp Fisheries

The Council expressed its concern of the likely negative impact on future recruitment to the redfish fisheries from the discards of small redfish in trawl fisheries for shrimp in Subarea 1 and in Div. 3M. In Subarea 1 a dramatic decline of adult redfish (≥ = 16 cm) to an extremely low level has been observed. The Council therefore stressed that this mortality component be included in the assessment of the redfish stocks. This requires that estimates of the magnitude of these by-catches and biological sampling data be made available.

It is important that information on by-catches be provided on numbers and sizes of the redfish as well as weight of the by-catch, whether or not sorting mechanisms are employed, because of the size selectivity of these devices.

With respect to the shrimp fishery in Div. 3M, information on by-catches in the shrimp fishery only up to July 1993 was available. The Council stressed that all information for 1993 be made available when the shrimp resources in this Division will be assessed in September 1994. It was also stressed that the annual information should be made available in advance of the June meeting, when the status of Div. 3M redfish is assessed, because of the relevance of this information to the assessment.

4. Documentation of the Work of the Scientific Council

With respect to the reorganization of the work of the Scientific Council, the Council reviewed the documentation of its work and its publications. The Council decided to change the documentation of the assessments. It was agreed the assessments results, after they are adopted by STACFIS, will be printed as an SCS document. The STACFIS report will be reduced to report on internal matters of the Committee and printed as an SCS document. Similarly the STACREC, STACFEN and STACPUB reports will be compiled independently as SCS documents. The Scientific Council report will now additionally deal with those matters which are responses to requests from the Fisheries Commission or Contracting Parties, and a compilation similar to the present Scientific Council Reports will be issued as SCS documents for each meeting. The Executive Summary will be discontinued. Details on all proposed documentation are given in Annex 3.

It was suggested that the assessment documents which are now issued as SCR documents should be issued as SCS documents, and should be reviewed by STACFIS. The Council agreed that further discussion on the arrangement of this work during the September 1994 Meeting should finalize the disposition of future Scientific Council documents.

XI. ADOPTION OF REPORTS

1. **Standing Committee Reports**

At its concluding session on 22 June 1994, the Council reviewed and **adopted** the Reports of the Standing Committees, STACFIS, STACREC and STACPUB.

2. **Scientific Council Report, June 1994**

At its concluding session on 22 June 1994, the Council reviewed and **adopted** the Report of the 8-22 June 1994 Meeting of the Scientific Council.

XII. ADJOURNMENT

There being no other business, the Chairman extended special thanks to the Executive Secretary, the Assistant Executive Secretary and the staff of the Secretariat for exceptional efficiency and support. He thanked all participants for their contributions and the Chairmen of the Standing Committees and Subcommittee for conducting an efficient meeting. He adjourned the meeting wishing everybody a safe trip home and looking forward to seeing the participants again in September at the Annual Meeting.

ANNEX 1

SCIENTIFIC COUNCIL MEETING - JUNE 1994

Changes to Rules of Procedure for the Scientific Council

by

H. Lassen
Chairman of Scientific Council

The Council considered the need to change its Rules of Procedures and based on some proposals from representatives, the Chairman in consultation with the Executive Committee drafted the proposed wording for Rule 5.1 a), 5.1 b), 5.1 c) and a new Rule 5.1 d) for a new Standing Committee. After further review, the Council by unanimous vote, adopted the Rules as presented below in accordance with Article X.2 of the Convention. Rule 5.1 c) shall remain unchanged.

The new **Rule 5.1** shall now read as follows:

5.1 There shall be the following standing committees:

a) The **Standing Committee on Fisheries Science (STACFIS)** which shall:

i) assess the status of fish stocks upon the request of the Scientific Council;
ii) assess the effects on fish stocks of fishing strategies and management upon the request of the Scientific Council; and
iii) evaluate new methods for fish stock assessment.

b) The **Standing Committee on Research Coordination (STACREC)** which shall:

i) develop and recommend to the Scientific Council policies and procedures for the collection, compilation, and dissemination of statistical and sampling information on the living resources and fisheries in the Convention Area;
ii) coordinate the compilation and maintenance of statistics and records and their dissemination, including liaison with coastal states in the Convention Area;
iii) coordinate the planning and execution of international cooperative research in co-operation with coastal states in the Convention Area;
iv) encourage and promote cooperation among the Contracting Parties in scientific research designed to fill gaps in knowledge pertaining to fisheries matters identified by the Scientific Council; and
v) review and evaluate data and information and advise the Scientific Council on advances in knowledge of biology relevant to the Convention Area;

c) The **Standing Committee on Publications (STACPUB)** which shall:

i) develop, coordinate and keep under review the publication and editorial policy and procedures of the Scientific Council and make recommendations thereto on these matters; and
ii) be chaired by the Vice-Chairman, and consist of five other members appointed by the Scientific Council.

d) The **Standing Committee on Fisheries and Environment (STACFEN)** which shall:

i) develop and recommend to the Scientific Council policies and procedures for the collection, compilation and dissemination of environmental information from oceanographic investigations;
ii) provide reviews of environmental conditions and advise the Scientific Council on the effects of the environment on fish stocks and fisheries in the Convention Area; and
iii) encourage and promote cooperation among Contracting Parties in scientific research designed to fill the gaps in knowledge pertaining to the effects of the environment on fish stocks and fisheries as identified by the Scientific Council.

ANNEX 2

SCIENTIFIC ADVICE ON SEALS

1. The following request for advice was received on 17 June 1994. This was presented to the Scientific Council with a view to developing terms of reference for a proposed meeting of the ICES/NAFO Working Group.

"Denmark (on behalf of Faroe Islands and Greenland) request advice from the NAFO Scientific Council (eventually via the Joint ICES/NAFO Working Group on Harp and Hooded Seals) on the following issues:

Harp and hood seals

- assessment of stock sizes, distribution and pup production of harp and hooded seals in the Northwest Atlantic;
- assessment of sustainable yields at present stock sizes and in the long term under varying options of age composition in the catch;
- advise on catch options in the NAFO area;
- assessment of effects of recent environmental changes or changes in the food supply and possible interaction with other living marine resources in the area.

Einar Lemche
Namminersornerullutik Oqartussat
Gronlands Hjemmestyre
Copenhagen, Denmark"

ANNEX 3

PROPOSED PUBLICATIONS RELATED TO THE DOCUMENTATION TO THE SCIENTIFIC COUNCIL STARTING AS OF 1 JANUARY 1995

With regards to the reorganization of the work of the Scientific Council, the following are the publications and the proposed disposition of the documentation related to the Scientific Council, starting as of 1 January 1995.

1. **Journal of Northwest Atlantic Fishery Science** (unchanged, peer reviewed)

Scientific contributions from individual scientists. Aimed at the general scientific community.

2. **NAFO Scientific Council Studies** (unchanged, limited review)

Scientific contributions from individual scientists. Aimed at the general scientific community, and more specifically at the fishery scientists working in the Northwest Atlantic.

3. **SCR Document** (no review)

Scientific contributions from individual scientists, including Preliminary Assessments by Designated Experts.

Documentation relevant to the topics discussed at the Scientific Council meetings and preliminary data and analyses; may be considered later in a more complete form for publication in Studies or in the Journal.

4. **SCS Document** (reviewed within Scientific Council or external bodies)

a) Statistical updates
b) National research reports
c) External committee reports (e.g. CWP, Working Group on harp and hooded seals)
d) STACFIS accepted assessments
e) Internal Reports of the Standing Committees (STACFIS, STACREC, STACFEN and STACPUB)
f) Scientific Council Reports (each meeting)
g) Other summary documents (survey plans, ...)

The papers documenting the STACFIS accepted assessment will be issued as SCS Documents and be made available from the Secretariat upon request.

5. **Statistical Bulletin** (edited by the Assistant Executive Secretary) (unchanged)

Fisheries statistics

6. **Scientific Council Reports** (issued annually) (will contain all Scientific Council Meeting Reports of each year. These will be issued with the usual red cover).

a) Requests for advice
b) Scientific Council Reports
   - Records of Scientific Council meetings including lists of SCR and SCS Documents presented, Agenda and list of participants
   - Annual overview of the fisheries in the Convention Area
   - Annual overview of the environmental conditions in the Convention Area
   - Assessment of fish stocks as requested by the Fisheries Commission and by Contracting Parties
   - Response to other requests from the Fisheries Commission and Contracting Parties
   - Other recommendations

This report is primarily aimed for the Fisheries Commission and Contracting Parties.

The format of the assessments as presented in the Scientific Reports should include:

- Reference to SCS Documents where the STACFIS accepted assessment can be found
- Reference to SCR Documents drawn upon for the assessment
- Description of the fishery
- Prognosis and management recommendation
- Summary sheet
- Basic graphs:
  i) Catch and TAC *vs* year
  ii) Abundance indices for analytical assessments
  iii) Recruitment and SSB *vs* year
  iv) Fishing mortality *vs* year
  v) Yield and SSB *vs* rel F for the year of projection
  vi) Any other graph deemed essential for understanding the management advice

The STACFIS accepted assessment documents (SCS Doc. mentioned in 4.d above) of a given meeting will be compiled in a single set, with a red cover identifying the set of documents as being the accepted assessments. This package will be issued to participants of the Annual Meeting, and to governments according to an appropriate mail list.

7. **Executive Summary**

Discontinued

8. **Working Papers** (not referred to in published reports)

Any information which should be disseminated to Scientific Council and its Committees during session, but not relevant for use after the meeting is concluded.

9. **Dumm Documents**

Humour to brighten the life of Scientific Council and Committee members.

APPENDIX I. REPORT OF STANDING COMMITTEE ON FISHERY SCIENCE (STACFIS)

Chairman: H. P. Cornus Rapporteur: Various

The Committee met at the Keddy's Dartmouth Inn, Dartmouth, Nova Scotia, Canada during 8-22 June 1994, to consider and report on matters referred to it by the Scientific Council, particularly those pertaining to the provision of scientific advice on certain finfish and invertebrate marine stocks. Representatives from Canada, Cuba, Denmark (in respect of the Faroe Islands and Greenland), European Union (Denmark, France, Germany, Portugal, Spain), Japan and Russian Federation were in attendance, as well as an observer from United States of America.

Various scientists assisted in the preparation of the reports considered by the Committee. The report of the Subcommittee on Environmental Research (M. Stein, Chairman) is summarized in Section III and detailed in Annex 1 below.

I. GENERAL REVIEW

1. Opening

The Chairman welcomed the representatives to the Keddy's Dartmouth Inn in Dartmouth. The provisional agenda was modified to reduce the workload of STACFIS and in light of the proposed changes in the Rules of Procedure, it was agreed that agenda item 9 of the Provisional Agenda on review of SCR and SCS documents not related to assessments would be moved for consideration under STACREC.

2. Available Assessment Data

During the first day of the meeting, all available information on catch data for the various stocks were reviewed in order to provide best estimates of catches for the assessments. This procedure proved to be as successful as it was in the previous year. STACFIS agreed to the Chairman's proposal that it would be a valuable investment of time to devote the first two days of the meeting for discussions among the representatives on the available assessment data and the preparation of preliminary assessments before the full Committee discussed them.

Nevertheless, recognizing that for most of the stocks basic catch data were insufficient or recent information was not available, assessments were carried out as was done in previous years. STACFIS recognized because of this, the quality of the assessments was not as good as desired.

STACFIS reiterated its **recommendation** that *the Scientific Council bring the problem of non-availability of assessment related data to the attention of the Fisheries Commission* (NAFO Sci. Coun. Rep., 1992, p. 78).

3. General Trends for the Northwest Atlantic

Noting the STACREC observation that there was a large number of countries that had not submitted STATLANT 21A data for 1993, and that it was not possible to prepare a meaningful tabulation to observe trends, STACFIS agreed this study would not be undertaken during this meeting. STACFIS expressed its serious concerns that the basic data (STATLANT 21A) needed for assessments have not been presented by Contracting Parties. (Data subsequently published in SCS Doc. 94/25, Serial No. N2488.)

II. REVIEW OF RECOMMENDATIONS FROM 1993 MEETINGS

An improvement was reported on the early provision of assessment-related data to the Designated Experts compared to 1993. However, it was not considered to be sufficient to meet the requirements of Designated Experts. Therefore, STACFIS emphasized the importance of availability of data and again **recommended** that *for the future, national representatives, at the same time as endeavouring to make all necessary data relevant to the assessments available to Designated Experts by May 15 (NAFO Sci. Coun. Rep., 1991, p. 44), should also attempt to provide as much catch/effort data (including preliminary data) as are available.*

STACFIS noted the presentation of estimates derived from surveys (e.g. abundance, biomass) accompanied by associated variances had improved but there were still deficiencies. STACFIS reiterated the **recommendation** that *in future, numbers (e.g. abundance/biomass) derived from research surveys be accompanied by estimates of variance* *associated with these.* In addition, information on vessels conducting the surveys, timing of the surveys and the fishing gear used including information as to how they may have changed over time, should be provided.

Further to the Scientific Council recommendation in June, 1993 that SCR Documents should be announced 15 days before Scientific Council meetings, about 40 papers were announced and of those 11 were submitted before this meeting. STACFIS noted the value of the early submission of papers, and this encouraged the Committee to extend the requirements stated in June 1993 (NAFO Sci. Coun. Rep., 1993, p. 43) and **recommended** that *Scientific Council Research Documents (SCR Doc.), excluding assessment papers, and Scientific Council Summary Documents (SCS Doc.) particularly the National Research Reports, in future be submitted to the Secretariat 15 days before the beginning of the Scientific Council Meeting.*

III. ENVIRONMENTAL RESEARCH

STACFIS received the report of the Subcommittee on Environmental Research, welcoming the opportunity to review environmental conditions before undertaking stock assessments. The following is a summary, the detailed report of the Subcommittee is given in Annex 1.

1. Introduction

The thirteenth meeting of the Subcommittee on Environmental Research was held on 9 June 1994 with M. Stein (EU-Germany) as Chairman. The meeting began with an invited lecture by Dr. Sally Goddard from Memorial University, Newfoundland. She presented results from ongoing research on Antifreeze Protein Production in Cod and described their potential to survive in the extremely cold bottom waters of the Newfoundland Shelf.

The forthcoming NAFO Special Session on 'Impact of Anomalous Oceanographic Conditions at the Beginning of the 1990s in the Northwest Atlantic on the Distribution and Behaviour of Marine Life' will be scheduled for 15-16 September 1994, at NAFO Headquarters, Dartmouth, Nova Scotia. A total of 12 papers had been announced by 15 June 1994.

2. Review of Environmental Studies in 1993

Sixteen documents dealing with environmental issues were reviewed.

Extremely cold air temperatures (monthly mean anomalies of up to -8°C) were observed in winter off West Greenland while above normal air temperatures persisted in September and October. This might have affected the upper ocean thermal conditions off West Greenland, which indicated positive anomalies in the top 200 m for autumn 1993.

Extremely cold air temperatures were again observed over southern Labrador and Newfoundland especially in winter, due in part to an intensification of the atmospheric circulation pattern. One index of the latter was the North Atlantic Oscillation (NAO) anomaly, which was strongly positive.

Similar to 1992, ice formed early, spread more rapidly, was of greater concentration and lasted longer than normal off southern Labrador, Newfoundland and in the Gulf of St. Lawrence.

Sea temperatures in Div. 2J and 3KL showed colder-than-normal upper layer temperatures in 1993 except near the coast where they were above normal. In the waters below 75 m, temperature anomalies continued to be between -1° and -2°C. Similar to the years 1991 and 1992, large areas of the continental shelf had below normal bottom temperatures. The cold intermediate layer (CIL) over the northeast Newfoundland Shelf and off Cape Bonavista was more extensive than normal in the autumn of 1993. The area of CIL waters increased over 1992 off Cape Bonavista but decreased along the Seal Island (Hamilton Bank) section.

Environmental conditions in the Newfoundland area during the spring of 1994 indicated that cold air temperatures persisted through the early months of 1994 resulting in more extensive ice cover than normal over the Newfoundland Shelf.

Studies on otolith ring structures of cod from Flemish Cap indicated a relationship to environmental changes in the area. Feeding and prespawning aggregations of silver hake on the Scotian Shelf were closely linked to warm offshore waters.

Deep water temperatures on the Scotian Shelf (Emerald Basin) and in the Laurentian Channel at Cabot Strait were above normal and increased over the 1992 temperatures.

Cold waters were observed in the 50-100 m depth range over the Scotian Shelf with several regions reaching anomalies equivalent to those recorded in the 1960s. The decline in temperature had begun in the mid- to late-1980s. In contrast, slope waters off the Scotian Shelf appeared to be warm in the upper 200-300 m.

Monthly monitoring of surface and bottom temperatures in the Middle Atlantic Bight and in the Gulf of Maine showed generally cooler-than-normal conditions.

IV. STOCK ASSESSMENTS

1. Review of Assessment Methods Used

There was a proposal to present during the June 1995 Meeting, the Extended Survivor Analysis (XSA) Method which is used in ICES stock assessments. The Committèe, however, argued that in the near future it would be confronted with the fact that there will be very little commercial fishery data since there have been closures of fisheries for most Grand Bank fish stocks. The Committee considered instead to encourage reviews and investigations on the problems of comparability and usefulness of survey results. Some discussion on this subject considered the possibility of a special session, however, no special session was proposed for the present.

2. Cod in Divisions 2J, 3K and 3L (SCR Doc. 94/12, 40; SCS Doc. 94/13)

a) Introduction

i) Description of fishery

Nominal catches for this stock increased during the late-1950s and early-1960s and peaked at just over 800 000 tons in 1968 (Fig. 1 and 2). Catches rapidly declined thereafter and were at a low of 139 000 tons in 1978. From 1980 to 1992 catches ranged from 219 000 to 270 000 tons, but declined to 150 000 tons in 1991 and further to 44 000 tons in 1992 reflecting management actions. In the same period Canadian catches peaked at 242 000 tons in 1988 but subsequently declined to 29 000 tons in 1992.

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Fixed Gear Catch	98	80	72	79	101	103	113	60[1]	12[1]	9[1]	
Offshore Catch	135	151	179	156	168	151	106	90[1,2]	32[1,3]	2[1]	
Total Catch	232	231	252	235	269	253	219	150[1]	44[1]	11[1]	
TAC	266	266	266	256	266	235	199	190	120[4]	[4]	[4]

[1] Provisional.
[2] Canadian surveillance estimate 111 tons.
[3] Fishery closed by EU in June 1992.
[4] Moratorium on Canadian fishing became effective in July, 1992.

The commercial fishery on this stock was closed in mid-1992. At the end of 1993 the recreational fishery was closed. It was estimated that during 1993 this fishery took about 9 000 tons of cod. Most of this catch was taken by handline in Div. 3L, and mainly during the September-October period. Canadian Surveillance has estimated that about 2 500 tons of cod were caught by non-Canadian fleets operating in the NAFO Regulatory Area on or east of the Nose of the Grand Bank in Div. 3L.

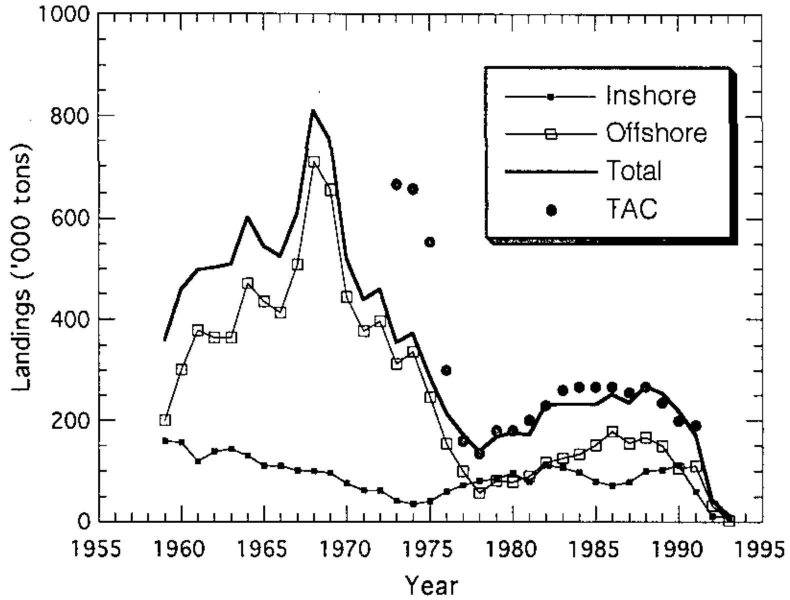


Fig. 1. Cod in Div. 2J+3KL: inshore and offshore landings and TACs.

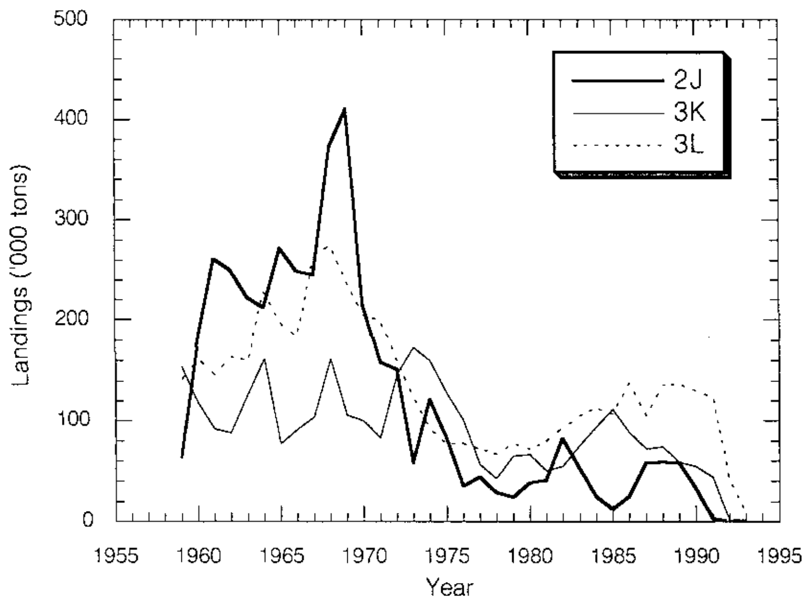


Fig. 2. Cod in Div. 2J+3KL: landings by Division.

ii) **Environmental conditions**

Detailed information on environmental conditions in the area is contained in the report of the Environmental Subcommittee (Annex 1). Following the 1960s period of relatively warm oceanic conditions over the shelves of Newfoundland and Labrador, there has been a series of three cold episodes, 1972-73, 1984-85, and 1989 to the present. Temperatures recorded at Station 27 during the 1990s have been anomalously low when compared with the mean for years since 1946. It is not yet possible to evaluate the impacts of these environmental trends on the cod stock.

b) **Input Data**

i) **Commercial fishery data**

Catch- and weight-at-age. The total catch was only approximated in 1993 and therefore catch-at-age could only be roughly estimated. Sampling was available to adequately estimate age and length compositions of the catch from the recreational fishery. A limited amount of data was provided for the non-Canadian 'by-catch' fishery in the Regulatory area. Catch-at-age for the latter was estimated by applying the Canadian spring Div. 3L research vessel age-length key. Average weights-at-age increased from the early-1970s to the early-1980s and subsequently declined. The 1992 average weights-at-age for ages 4-7 were the lowest since those of the 1960s and 1970s.

Catch and effort. Prior to the 1993 assessment of this stock, commercial otter trawl catch and effort data were used in the calibration of SPA. The resulting analyses had indicated that the patterns, or year effects, in the residuals were persistent and sufficient to preclude their use as an abundance index. In any case, this information was not available for 1993 as there had been no directed fishery. Adequate catch and effort data from inshore fixed gear fisheries are not available from Canadian Department of Fisheries and Oceans statistics.

ii) **Research survey data**

Canadian trawl surveys. Research vessel surveys have been conducted by Canada during autumn in Div. 2J, 3K,and 3L since 1977, 1978, and 1981, respectively. Since their inception, the surveys in Div. 2J and 3K have experienced difficulties in specific areas with respect to the accuracy of nautical charts and the recorded depths. These charts had formed the basis for stratification charts. The availability of accurate charts in the late-1980s resolved some of these problems but necessitated some adjustment to the original stratification scheme, particularly in Div. 2J. The revised stratification schemes were first used during the 1993 autumn surveys. Some difficulties were encountered in comparisons with previous strata although the total area covered was only slightly different to that of the original stratified area. Estimates of abundance and biomass from autumn surveys have declined sharply in recent years with the 1993 value being extremely low (Fig. 3). Similarly, the 1993 spring survey conducted in Div. 3L indicated that biomass and abundance in this Division are by far the lowest in the time series.

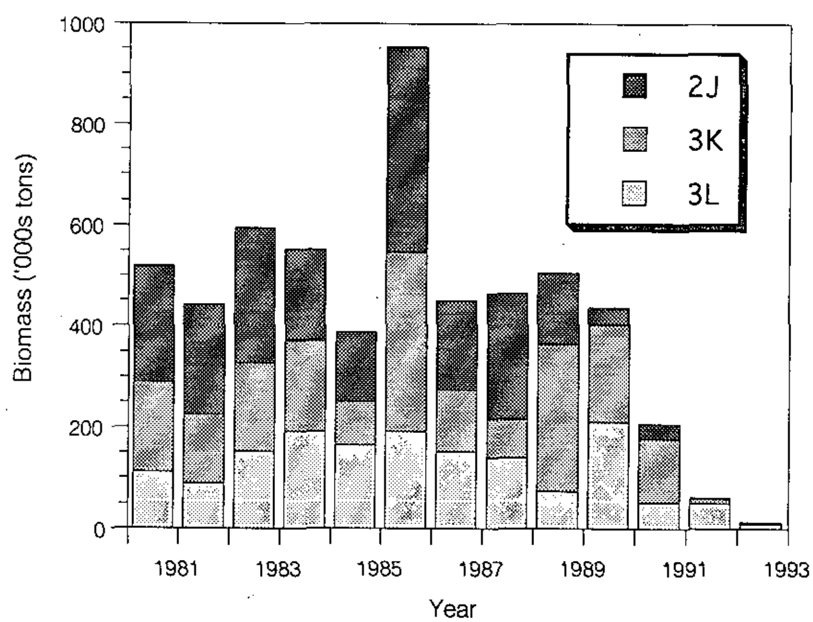


Fig. 3. Cod in Div. 2J+3KL: research vessel biomass.

The survey catches-at-age in 1993 were mainly from ages 3 and 4 although, as indicated, total abundance was very low. No cod were caught at ages older than 9 years.

Average weights-at-age from the 1993 surveys, although represented by small samples, were not substantially different from those observed in the 1992 survey. Recent average weights for all Divisions were substantially lower than those observed in the early- to mid-1980s.

The distribution of cod catches during the autumn surveys from 1981 to 1988 indicated a fairly typical pattern. Catches were spread over the entire survey area and most large catches were in shallower water. Commencing in 1989 fewer cod were found near the coast, particularly in Div. 2J. During 1990 and 1991 most cod were found on the seaward slopes of the offshore Banks and in 1992 and 1993 there were virtually none in Div. 2J and 3K and low abundance in Div. 3L. The only cod located during 1992 and 1993 were in the northern part of Div. 3L bordering with Div. 3K.

Abundance in Div. 2J and 3K generally increased at depths greater than 400 m since 1987 despite the fact that total survey abundance was constant or declining.

Autumn research vessel survey data were used to examine the age distribution of cod in Div. 2J and 3K. The age structure of the Div. 2J cod population collapsed from a wide age distribution (20+) in 1982 to a narrow (up to age 7) age range in 1992. This represented a loss of the majority of the mature fish. The average, modal and median ages of the Div. 2J and 3KL cod stock have ranged between about ages 5 and 6 over the last decade or so but has recently (1990s) decreased to about age 4 with a corresponding decrease in the width of the age distribution (maximum age 8 in 1992). This parallels a decrease in the total numbers of fish estimated for the stock.

Winter hydroacoustic surveys. Winter hydroacoustic surveys conducted since 1987 found large concentrations of cod in southern Div. 2J and northern Div. 3K at depths ranging from 300 to 500 m from 1987 to 1989 with concentrations occurring further south each year. In the 1990 survey, commercial concentrations of cod were found still further south in Div. 3K and mainly at 550 m, about 150 m deeper than in previous years. Survey data from 1991-93 indicated substantial declines in cod densities, particularly in 1993. Significant concentrations were encountered outside the main survey area at depths approximating 930 m on the Nose of the Bank. There was no comparable survey in 1994.

Spring hydroacoustic studies. Studies have been conducted during the 1990-93 period on the distribution and movements of cod in Div. 3K and 3L when they are concentrated in this area for spawning and prior to their migration to inshore areas.

From 1990-92, cod were highly aggregated in the basin south of Funk Island Bank (termed the "Bonavista migration channel"). Aggregation did not occur in this area. The distributions observed suggest that cod had moved along the slope further to the southeast in the winter of 1992/93. The aggregation located in the latter area was only 20-25 miles from an area of concentration located during the winter 1993 acoustic survey.

Cod were concentrated at similar temperatures and salinities in all years. Cod were also aggregated along the northern edge of the Grand Bank in 1991, 1992 and 1993 (no sampling was conducted there in 1990). Fish were located at depths of less than 400 m in 1990 and 1991. In 1992 fish were located up to and likely deeper than average acoustical enumeration limits (ca. 600 m). In 1993 fish were located at depths between 350 and 500 m.

The densities within the aggregations remained relatively stable in the 4 years studied. However, the volume of the aggregations declined sharply from 1990 to 1991, less so from 1991 to 1992, then sharply again from 1992 to 1993. The overall estimates of abundance declined dramatically from 1990 to 1991, then slightly from 1991 to 1992. Abundance estimates in 1993 were less than half those measured in 1992.

iii) **Other biological studies**

Food and feeding. Capelin was the major prey of cod in the offshore area of Div. 2J and 3K during the autumn of most years in the period 1978-89. During the recent decline in cod abundance and reduction in cod distribution, there was also a severe decline between 1989 and 1990 in capelin biomass as estimated from offshore Canadian and Russian acoustic surveys. Nevertheless, many cod had a relatively high content of capelin in their stomachs in 1990-92, in part because capelin changed their distribution and occupied the general area where the remaining cod were concentrated. A preliminary analysis of the average quantity of food in cod stomachs by Division (2J, 3K, 3L) revealed a decline only in Div. 2J (on Hamilton Bank in 1990 and in the whole Division in 1991 and 1992).

Condition factors. Information was available relative to condition factors (gutted weight/length^3) for cod in Div. 2J and 3KL. In both Div. 2J and 3K a declining trend was observed from 1990 to 1992 for all ages although it was less pronounced in Div. 3K. Estimates for 1993 were higher than 1992 in Div. 2J for all ages while those for Div. 3K were similar for 1992 and 1993. No trend was observed in Div. 3L although there was a decline at most ages from 1992 to 1993. The impact of factors such as changes in growth rate over time, migrations between Divisions and aliasing of the condition factors with respect to normal seasonal cycles in cod physiology on the interpretation of the results has not been determined.

c) **Estimation of Parameters**

A formulation of the Adaptive framework (ADAPT) using Canadian research vessel (RV) data was used to estimate stock size. The model formulation was the same as that used previously. A flat topped partial recruitment pattern was assumed as input along with full recruitment as an unweighted average over ages 7 to 9. The patterns of residuals that were produced showed strong year effects reflecting the large interannual variation in the RV index. Residuals for 1993 were all strongly negative while those for 1989 to 1992 were all positive. It was considered that the results from ADAPT did not adequately represent stock abundance. Consequently, it was not possible to provide an estimate of the size of the current stock biomass.

d) **Assessment Results**

Fishing mortality and stock abundance. Research vessel survey results imply that stock abundance has declined to less than 1/10 of that in the mid-1980s and that the decline persisted from 1992 to 1993 in spite of a moratorium on commercial fishing. It also suggested that the size of the 1986 and 1987 year-classes, which were originally considered to be above average are now well below average, particularly that of 1987. As well, the size of year-classes since that time (1988-90) are also well below average.

Although stock size and fishing mortality could not be estimated, analyses incorporating the extremely low RV abundance estimate for 1993 suggest that total mortalities in recent years have been very high and most likely in excess of 1.0 for the fully recruited age groups. Total mortality derived from surveys appeared to have declined between 1992 and 1993 presumably because of the fishery closure, but the level of mortality is too high to be explained by a catch of 11 000 tons. Possible reasons for this inconsistency include the following: 1) factors other than fishing are responsible for the observed declines; 2) year effects of the surveys in recent years are hampering calibration of SPA; 3) the 1993 catch has been underestimated. It is not possible to determine which of these or a combination might be correct.

It is possible that the recreational fishery in 1993 took fish predominantly originating from supposed inshore stocks. The areas where these fish would occur are not covered during the autumn surveys, and no information exists concerning possible trends in inshore 'stock' abundance.

Recruitment. The results from autumn and spring surveys indicate that the abundance of young cod remains low and consequently recruitment from recent year-classes can be expected to remain low.

A number of different aspects of 0-group and juvenile cod biology have been examined using beach seining, and pelagic and demersal 0-group/juvenile surveys to develop a scientific basis for prerecruit indices for this stock. The predominantly inshore distributions of pelagic (0-group) juvenile cod sampled during 1991-93 differed significantly from the offshore distribution observed in 1981. The different distributions are consistent with what one would expect based on historic and recent spawning distributions, and the modelled drift of cod eggs and larvae. Compared to the numbers sampled and the broad offshore distribution in 1981, it would appear that significantly fewer pelagic 0-group cod occurred in recent years, 1991-93. The distribution and abundance of 0-group cod in the near shore environment along the northeast Newfoundland coast in 1992-93 was remarkably similar to the historic distribution and abundance determined from sampling the same site in the early-1960s although abundance in 1992-93 tended to rank toward the lower part of the observed range. The persistence of 0-group cod with the nearshore environment indicates this is a preferred habitat for this age class. However, this continued presence contrasts with offshore observations that there has been a significant southward shift in spawning and significantly lower recruitment during the 1990s. The discrepancy between the distributions of pelagic 0-group cod and that of 0-group cod in the nearshore environment could be explained by maintenance of inshore spawning in the bays along the NE coast of Newfoundland.

The distributions of cod aged 1-3 years observed during the demersal surveys in 1992-93 are consistent with the historical description: age 1 cod predominate inshore while age 3 cod are more predominant offshore. Because directed sampling previously has not been carried out inshore a direct comparison to historical data is not possible. The recent observations emphasize that cod <3 years of age occur predominantly shoreward of the autumn RV survey boundary. As such, the RV survey might be expected to systematically underestimate the abundance of young cod, particularly small cohorts as a greater proportion will be shoreward of the survey boundary.

There was agreement between the capelin trap by-catch and RV ages 2+3 estimates indicating that the combined 1989-90 year-classes are at historically low levels. However, there was disagreement between the by-catch and RV ages 2+3 indices for the combined 1990-91 year-classes, which are ranked as "medium" and "lowest" for the two time series, respectively. Year-class size in 1991 appears to be very low, based on the beach seine, the pelagic 0-group, demersal juvenile and RV ages 2+3 indices. However, the 1992 year-class appears to be moderately good, based on the beach seine, pelagic 0-group and demersal juvenile indices. The 1993 year-class appears to be relatively low, based on the beach seine and demersal juvenile indices, and historic comparison to 1981 for the pelagic 0-group survey.

d) **State of the Stock**

Although it was not possible to provide an adequate determination of absolute stock size, it was possible to describe general trends from the data.

The Div. 2J and 3KL cod stock abundance increased from the mid-1970s to the mid-1980s but has since declined. The stock decline continued in 1993 and the stock is at a record low level. Furthermore, the decline is greater than would be explained by estimated catches in 1992 and 1993, although there are indications that total mortality declined somewhat.

Survey data indicate that recent year-classes are poor and the low recruitment levels will probably persist. Consequently, stock recovery will not occur in the near future.

3. **Cod in Division 3M** (SCR Doc. 94/12, 22, 26, 62; SCS Doc. 94/3, 13, 16)

a) **Introduction**

i) **Description of the fishery**

The cod fishery on Flemish Cap has traditionally been a directed fishery by Portuguese trawlers and gillnetters, Spanish pair-trawlers and Faroese longliners. Cod was also caught as by-catch in flatfish fisheries conducted by Spanish trawlers as well as in the redfish fishery by Portuguese trawlers. Insignificant amounts of cod are taken as by-catch in Russian pelagic fishery for redfish. The fleet currently operating in Div. 3M includes vessels from non-Contracting Parties.

ii) **Nominal catches**

From 1974, when a TAC was first established, to 1979, catches ranged from 22 000 to 33 000 tons. Catches had been at that level or higher for the previous ten years. The TAC was 13 000 tons for 1980-87, while the reported nominal catches were about 12 000 tons.

Recent TACs and catches ('000) tons are as follows (Fig. 4):

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
TAC	13	13	13	13	0	0	0	13	13	13	11
Catch	13	14	15	11	2	40[1]	32[1]	11[1,2]	11[1,2]	13[1,2]	

[1] Includes estimates of misreported catches.
[2] Provisional.

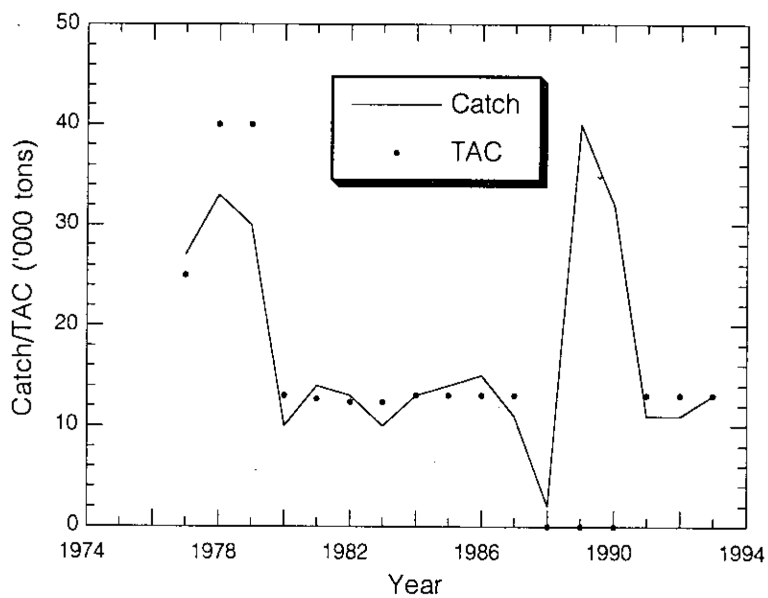


Fig. 4. Cod in Div. 3M: catches and TACs.

A moratorium on the Flemish Cap cod fishery was established by the Fisheries Commission for 1988 to 1990. However, catches for 1989 and 1990 have been estimated to be about 40 000 and 32 000 tons, respectively. Reported catches for 1989 and 1990 were about 1 000 and 2 000 tons, respectively. No estimate of unreported catches was available for 1988, but it is believed that actual catches also exceeded those reported for that year.

Catch figure for 1993 is an overall catch estimation, and it includes catch estimates for all fleets, including those from non-Contracting Parties.

b) **Input Data**

i) **Commercial fishery data**

Sampling catch data for 1993 were available for Portuguese trawlers and gillnetters and Spanish pair-trawlers. Samples were selected from the whole catch before it was sorted and discarding occurred. Gillnetter fleet catches were dominated by 1985 and 1986 year-classes, which had been relatively abundant, and its CPUEs had increased somewhat since 1992. Those year-classes were not significant in trawl catches, which were based on younger age-groups. Trawler CPUE decreased from the highest value in 1992, when a directed fishery on small size fish concentrations was undertaken. Pair-trawl catches were based on the 1989 and the more abundant 1990 year-classes.

Cod from the 1989 year-class and from the abundant 1990 year-class, aged 4 and 3 years respectively, dominated the catch in 1993. In that year small sized cod of the 1991 year-class was the most abundant cohort in the stock according to surveys, but its occurrence in the catch was low, indicating that catches shifted in 1993 to older age-groups than in 1992.

ii) **Research survey data** (Fig. 5)

Biomass and abundance estimates were available from research vessel bottom trawl surveys conducted by USSR/Russia from 1977 to 1993, with concurrent acoustic surveys from 1985. The estimates of trawlable plus acoustic biomass of the pelagic zone decreased from a peak of 78 300 tons in 1989 to 2 500 tons in 1992, and increased to 13 800 tons in 1993.

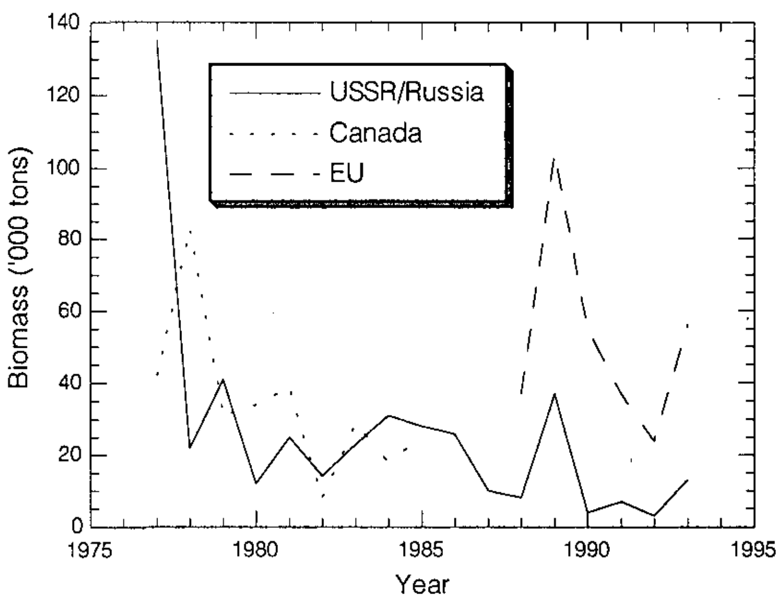


Fig. 5. Cod in Div. 3M: total trawlable biomass estimates.

Stratified-random bottom trawl surveys were conducted by the EU from 1988 to 1993. The surveys also showed a decline of trawlable biomass from 103 600 tons in 1989 to 24 300 tons in 1992 and an increase to 55 600 tons in 1993.

The maximum stock biomass in 1989 indicated by surveys was produced by the abundant 1985 and 1986 year-classes when aged 4 and 3 years, respectively. Both surveys also indicated that bottom trawlable biomass in 1993 was at the second highest level since 1988. The increase in biomass from 1992 to 1993 must be attributed to the contribution of two relatively abundant year-classes, those of 1990 and 1991, which constituted 89% of total biomass according to EU survey results.

Abundance decrease of each cohort in EU survey, expressed by its fishing mortality coefficient equivalence, is presented in the following table to illustrate the high level of the fishing mortality exerted on the stock:

mean : unweighted mean over years
F 3+ : weighted by abundance-at-age
Y 3+ : catch corresponding to F3+ and July to July

Age	1988	1989	1990	1991	1992	1993	Mean
1 :	-1.08	0.37	-2.58	1.11	-0.82		-0.60
2 :	-0.36	0.66	-0.47	1.48	0.06		0.27
3 :	-0.40	1.47	0.69	1.83	1.34		0.99
4 :	-0.74	1.02	0.74	1.56	0.27		0.57
5 :	-0.19	1.35	1.93	1.39	0.46		0.99
6 :	0.18	1.18	2.56	1.91	0.73		1.11
7 :	0.65	-0.06	3.27	3.02	0.54		1.48
8 :		0.21	0.98				0.60
9 :							
10 :			0.90				0.90
11 :							
12 :							
F 3+	-0.47	1.28	1.16	1.69	0.83		
Y 3+	-13338	63039	35216	19272	4437		
Catch(t)		40000	32000	11000	11000	13000	

c) **Estimation of Parameters**

An analytical assessment of the stock has not been conducted since 1984 because of perceived inadequacies in the commercial fishery database.

d) **Prognosis**

The abundance of cod older than 5 years is low on Flemish Cap as a consequence of a very high fishing mortality in recent years. The fishable stock is mainly composed of small fish, which were traditionally overfished. This is an inadequate state for a proper exploitation of the resource, and the situation will remain unchanged at the current fishing intensity. STACFIS reiterated its previous advice that a rationally exploited cod fishery on Flemish Cap requires first to impede catches on immature fish, and second to control the exploitation rate through fishing effort or catch. If these two management conditions cannot be achieved, the cod fishery will remain as an opportunistic fishery where the catches will follow recruitment fluctuations, but the overall yield of the fishery will be well below its potential level.

A trawl fishery in 1995 would be based on the 1990 and 1991 year-classes when they are 5 and 4 years old, respectively, if the current fishing pattern is maintained. Both year-classes appeared relatively abundant in the Russian and EU surveys when they were of ages 2 and 3 in July 1993, but they would be noticeably reduced at the beginning of 1995, after supporting the fishery in 1994. These two year-classes offered the opportunity to rebuild the spawning stock. Therefore STACFIS **advised** that no directed fishery on cod in Div. 3M be conducted in 1995, to allow stock recovery.

4. **Cod in Divisions 3N and 3O** (SCR 94/12, 30, 51, 87; SCS 94/2, 3, 13, 16)

a) **Introduction**

i) **Assessment of February 1994**

The cod stock in Div. 3NO was assessed in February 1994 at a special meeting of the Scientific Council (NAFO SCS Doc. 94/2). The assessment indicated that population abundance had declined from recent highs in the mid-1980s. The stock in 1993 was represented mainly by younger age groups, namely the 1989 and 1990 year-classes. These year-classes were estimated to be more abundant than they had been in the 1993 assessment due to their strong appearance in the Canadian and Russian 1993 spring surveys. However, the Canadian survey found these year-classes in predominantly two strata and both spring survey estimates had large confidence limits. Two new survey indices used in the February 1994 assessment (Canadian autumn and juvenile groundfish surveys) indicated a reduction in the 1989 and 1990 year-classes in 1993. It was suggested that the results from 1993 spring surveys should be treated with some caution until they could be evaluated by further surveys.

During the February 1994 assessment it was observed that the determination of present stock levels was also greatly influenced by the option of partial recruitment (PR), adopted-domed or flat-topped. This choice has also had a major influence on estimates of stock size in the past. The domed pattern (40% of fully recruited fishing mortality) resulted in biomass estimates that were about 80% higher in the mid-1980s than with the flat-topped PR and implied that biomass in the mid-1980s was equal to or larger than in the mid-1960s when landings were consistently in excess of 100 000 tons. The latter appeared to be unrealistic. STACFIS found that the flat-topped pattern better reflected the stock trends but the data and analysis available at that time were considered insufficient to determine the most appropriate PR. Consequently the stock status was considered using population estimates derived from both PR options.

Regardless of the option used in the February 1994 assessment, the analysis indicated that the stock had declined since the mid-1980s to levels at or approaching those in the mid-1970s, which were the lowest observed. Projected stock increases in the near future would be dependent on the size of the 1989 and 1990 year-classes, as the preceding 6 year-classes (1983-88) were well below average.

The current review of stock status uses additional data and presents analyses completed since the February meeting.

ii) **Description of fishery**

No new information was available in relation to 1993 catch statistics. The Fisheries Commission, during its February 1994 meeting, recommended that there be no directed fishery in 1994.

Recent TACs and catches ('000 tons) are as follows (Fig. 6):

Year	1986	1987	1988	1989	1990	1991	1992	1993	1994
Recommended TAC				Same as agreed					
Agreed TAC	33	33	40	25	18.6	13.6	13.6	10.2	6
Reported Catches	51	42	43	33	18	17[1]	10.1[1]	9[1]	
Non-reported Catches	-	-	-	-	11	12	2.5	0.7	
Total Landings	51	42	43	33	29	29[1]	12.6[1]	9.7[1]	

[1] Provisional

Weights in '000 tons

b) **Input Data**

i) **Commercial fishery data**

Catch-at-age. Since the last assessment, sampling data have become available for the Portuguese otter trawl and gillnet fisheries. Catch-at-age for these fisheries was previously derived using Spanish pair trawl and Canadian gillnet sampling. The inclusion of the new data from EU-Portugal increased the estimate of total numbers of cod removed at age, mainly from ages 3 and 4.

ii) **Research survey data**

The 1994 Canadian spring survey in Div. 3NO was completed in late May and preliminary estimates indicated that biomass and abundance had declined substantially (Fig. 7).

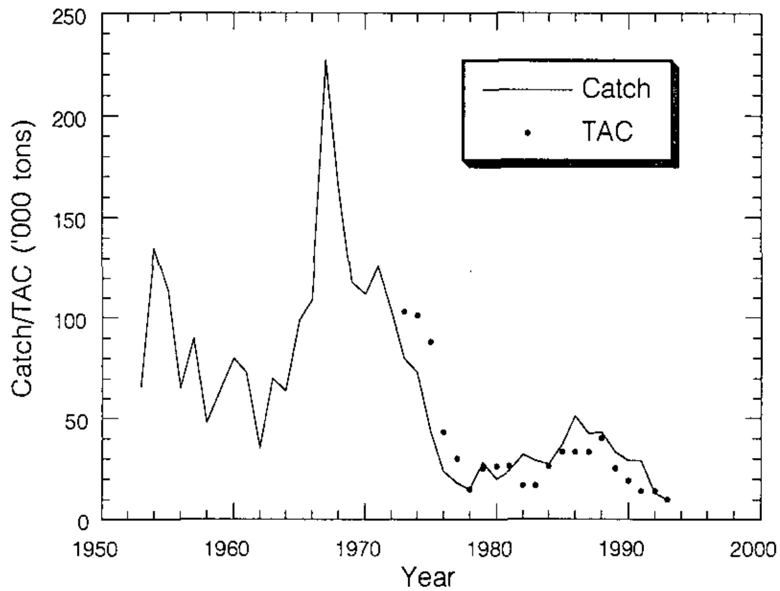


Fig. 6. Cod in Div. 3NO: catches and TACs.

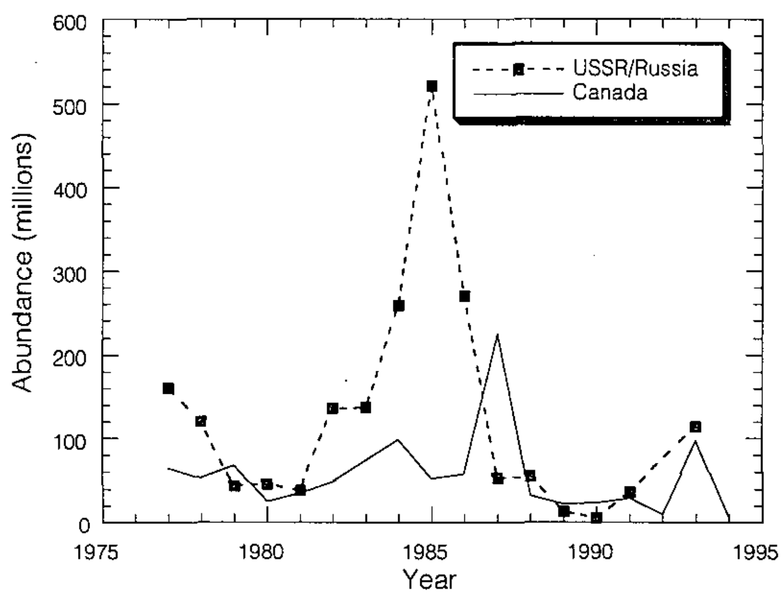


Fig. 7. Cod in Div. 3NO: abundance.

c) **Estimation of Partial Recruitment**

The impact of partial recruitment (PR) on estimates of stock status has been described earlier. Information was presented relative to the most appropriate PR pattern for this stock. An extension of the statistical model used to estimate abundance from commercial catch-at-age data was formulated to model the fishing mortality on the oldest ages. The analyses presented indicated that there was no significant difference from that of a flat-topped PR. Based on this, STACFIS concluded that the use of a flat-topped PR is appropriate for this stock.

d) **Updated Assessment Results**

Inclusion of the additional sampling data in the same formulation of ADAPT used in the February 1994 assessment along with flat-topped PR produced only slight changes in parameter estimates. Fishing mortalities increased slightly for most ages.

e) **Prognosis**

The advice given in February 1994 indicated that the 1994 TAC should not exceed 6 000 tons.

Preliminary results from the 1994 Canadian spring survey indicated a dramatic lower total abundance compared to the 1993 estimate (6%), which corroborates the lower total abundance estimates resulting from the 1993 Canadian autumn and juvenile groundfish surveys. The 1993 Canadian spring survey gave a more optimistic estimate.

STACFIS was unable to provide projections of reference level catches in 1995 because of concerns about the results of the analysis carried out in February 1994. That analysis drew attention to the dependence of the conclusions on the encouraging results of the 1993 spring surveys. The 1993 survey results had an unusually high variability, and conflicted with the evidence from the autumn surveys that the 1989 and 1990 year-classes were not as strong as estimated. At the current meeting, STACFIS learned that the estimates of total biomass for the 1994 Canadian spring survey reinforced the concerns that the equivalent 1993 survey results could be an outlier, and hence the 1989 and 1990 year-class may offer little opportunity for rebuilding. STACFIS **advised** therefore that it would be necessary to analyse all data from 1994 before it would be able to provide information on future trends in stock status and on requested reference catch levels.

Spawning stock biomass is at present at the lowest level on record and furthermore will be entirely dependent on the 1989 and 1990 year-classes. STACFIS **advised** that the stock must be allowed to rebuild. Any harvesting in 1995 will reduce the rebuilding potential. The first chance of a rebuilding is with the 1989 and 1990 year-classes which will only add substantially to the spawning stock in 1995 and 1996, respectively. STACFIS therefore **advised** that there should be no fishing for cod in Div. 3N and 3O in 1995.

5. **Redfish in Subarea 1** (SCR Doc. 94/6, 7, 9, 31; SCS Doc. 94/11, 14, 15)

a) **Introduction**

Historically, redfish were taken mainly as by-catch in the trawl fisheries for cod and shrimp. Landings were considered to be almost exclusively golden redfish (*Sebastes marinus* L.) until 1986. It is believed that subsequently the portion of beaked redfish (*S. mentella* Travin) represented in the catches increased, and since 1991, the majority of the redfish catches are considered to be beaked redfish. In 1977, total reported catches peaked at 31 000 tons (Fig. 8). During the period 1978-83, reported catches of redfish varied between 6 000 and 9 000 tons. From 1984 to 1986, catches declined to an average level of 5 000 tons due to a reduction of effort directed to cod by trawlers of the EU-Germany fleet. However, occasionally in this period, a directed fishery on redfish could be observed for this fleet. During the same time, a directed redfish fishery was initiated by Japanese trawlers, but they only partly compensated the reduction in the catches of EU-Germany. With the closure of the offshore fishery in 1987, catches decreased further to 1 200 tons, and remained at that low level in spite of increased effort by trawlers from Greenland and EU-Germany after the reopening of the cod fishery in 1988. Recent fishing effort was directed to shrimp or Greenland halibut only.

Both recent and historical catch figures, especially those reported since 1991 amounting to 300 tons, were believed to disregard substantial numbers of small redfish discarded by the trawl fisheries directed to shrimp and cod.

Recent catches ('000 tons) are as follows:

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Catch	7	6	4	5	1	1	1	0.4	0.3[1]	0.3[1]	0.3[1]

[1] Provisional.

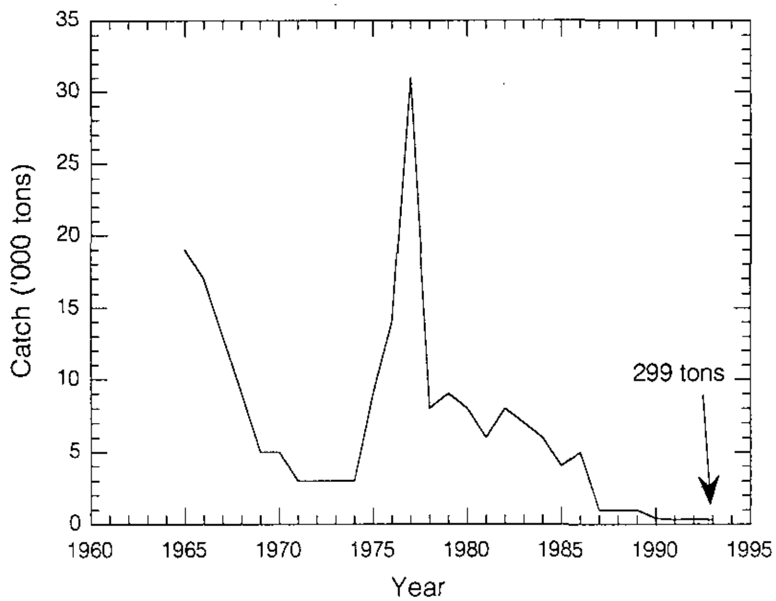


Fig. 8. Redfish in Subarea 1: catches.

b) **Input Data**

i) **Commercial fishery data**

No data available.

ii) **Research survey data**

EU-Germany groundfish survey. Annual abundance and biomass indices were derived from stratified-random bottom trawl surveys commencing in 1982. These surveys covered the areas from the 3-mile limit to the 400 m isobath of Div. 1B to 1F and were primarily designed for cod as target species. Therefore, the high variation of the estimates for redfish could be caused as a result of the incomplete survey coverage in terms of depth range and pelagic occurrence. The survey indices indicated that the adult component of golden and beaked redfish decreased dramatically during the period 1982-93, and were practically no longer existent in the surveyed area. Juveniles (<16 cm) assessed separately from recruits and adults were very abundant in northern strata (Div. 1B, 1C) and dominated aggregate redfish abundance of the total area since 1986 (88%).

Greenland shrimp survey. Stratified-random shrimp surveys covering depth zones of 0-600 m in Div. 1A to 1D have been conducted since 1988. Abundance, biomass estimates and length frequencies have been used as indicators for the status of the stocks although the catchability of the survey gear for large specimens could be ineffective due to low towing speed (2.5 knots). Abundance and biomass indices declined substantially (36%)

from 1988 to 1990. The surveys were extended to investigate the Disco Bay area and Div. 1E and 1F in 1991 and 1992, respectively. Changes in CPUE data due to a change in the codend mesh size of the 1993 survey were corrected by length-dependent conversion factors. Abundance and biomass estimates including *extended areas decreased* from 1991 to 1993 by 80% and 28%, respectively. Length frequencies confirmed the absence of redfish ≥16 cm.

Greenland-Japan groundfish survey. Since 1987, cooperative trawl surveys directed to Greenland halibut and roundnose grenadier have been conducted on the continental slope in Div. 1A-1D at depths between 400 m and 1 500 m. One trawl survey was carried out in August and September 1993. As usual, beaked redfish was mainly caught at depths less than 600 m and the density of small-sized redfish was higher in northern areas (Div. 1B). The trawlable biomass decreased from 3 700 tons in 1992 to 1 200 tons in 1993. This estimate represents the record low for the time series.

c) Prognosis

STACFIS noted that no commercial fishery data are available for the stock and that catch figures are believed to disregard discards of small redfish by trawl fisheries directed to shrimp and cod. The number of small redfish discarded is believed to be substantial. In view of dramatic declines of adult redfish (≥16 cm) to an extremely low level, *STACFIS concluded* that both exploitable stocks of golden and beaked redfish are severely depleted. Given that surveys indicated high abundance of pre-recruits (<16 cm), STACFIS **advised** that directed catches and by-catches of redfish in Subarea 1 be reduced to the lowest possible level.

6. **Redfish in Division 3M** (SCR Doc. 94/13, 22, 60; SCS Doc. 94/3, 13, 14, 16)

a) Introduction

The directed redfish fishery was traditionally conducted by Latvia, Lithuania, Estonia, Cuba, EU-Portugal, South Korea and Russia with bottom and midwater trawl as well with gillnets. Because of identification difficulties in commercial catches all the three species of redfish (*Sebastes marinus, S. mentella, S. fasciatus*) are considered together as a single management unit.

Reported catches in the period 1972-81 were reduced from 41 900 tons to 13 900 tons (Fig. 9). Catches began to increase in 1983 and were over double the TAC in 1987 and three times in 1989. The estimated catch for 1990 was the highest on record for this stock (81 000 tons). Since 1990 catches have declined to *29 000 tons in 1993, which* includes some estimated catch from surveillance reports. Catches have not exceeded TAC since 1991. Catches for 1990-92 have been revised based on updated information related to catches by non-Contracting Parties.

Recent catches ('000 tons) are as follows:

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
TAC	20	20	20	20	20	20	50	50	43	30	26
Catch	20	20	29	44	23	58[1]	81[1]	48[1,2]	43[1,2]	29[1,2]	

[1] Includes estimates of non-reported catches from various sources.
[2] Provisional.

There continues to be a substantial amount of non-reported catch accounted for by non-Contracting Parties. Since 1989 these catches have been in the range of 3 000 tons to 10 000 tons.

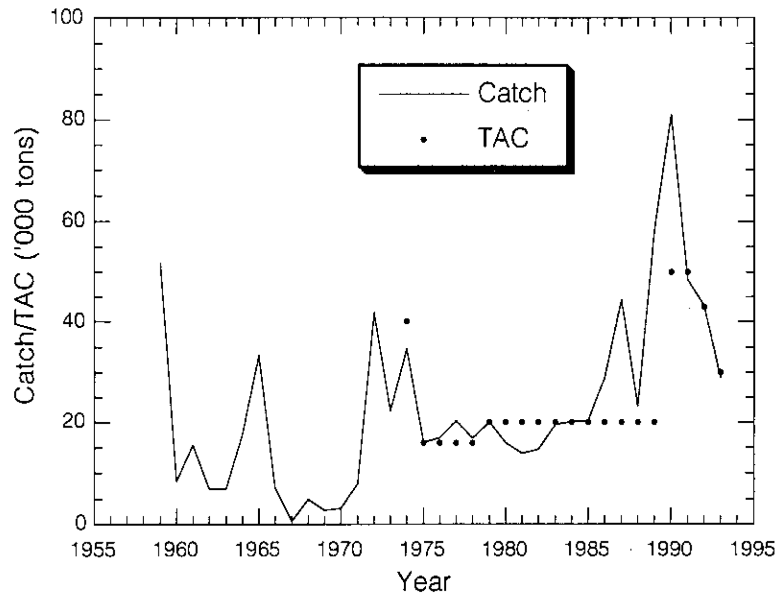


Fig. 9. Redfish in Div. 3M: catches and TACs.

b) **Input Data**

i) **Commercial fishery data**

A catch-rate database, with effort measured in hours fished and another with effort measured in days fished, were standardized with a multiplicative model (Fig. 10). Information for years prior to 1974 is limited and estimates for these years are considered unreliable. Both indices were consistent in terms of trends since the mid-1970s. Catch rates were fairly stable from 1975 to 1985. The catch rate increased sharply in 1986, peaked in 1987, and declined in 1988 to the level of the 1985 rate. Since 1988 catch rates have declined systematically to 1993, which is the lowest on record and are now only about 40-50% of those in 1986-87.

Portuguese directed effort for redfish stayed relatively constant between 1992 and 1993 but catch rate dropped from 0.891 tons/h in 1992 to 0.471 tons/h in 1993 and was the lowest one observed since 1989.

Sampling data consisted of *S. mentella* and *S. marinus* length and age composition for Portuguese gillnetters and length composition of redfish by-catch for Spanish pair-trawlers.

Fish in the range of 17-53 cm occurred in pair-trawl catches. Males 30-33 cm and 39-43 cm as well as females 28-34 cm and 38-43 cm dominated the catches. Gillnet catches consisted of *S. mentella* in the range of 18-65 cm and *S. marinus* 16-69 cm long. For both species lengths 35-40 cm dominated the catches. Smaller fish were also well represented in gillnet catches. During this meeting there were no data available on redfish by-catch in the shrimp fishery in Div. 3M.

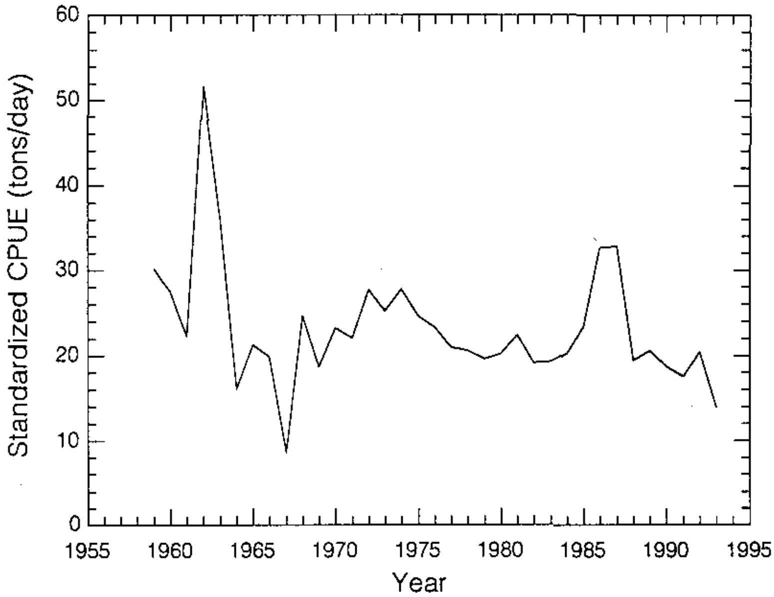


Fig. 10. Redfish in Div. 3M: standardized catch rates.

ii) **Research survey data**

Surveys were conducted in June-July 1993 by EU (bottom trawl survey) and by Russia (trawl-*acoustic* survey). Biomass estimates from the various surveys ('000 tons) are as follows:

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
USSR/Russia										
Trawl	132	52	310	106	47	83	18	45	18	70
Acoustic				350	332	283	229	62	82	77
Total				456	379	366	247	107	100	147
Biomass above bottom trawl (%)				77	88	77	93	58	82	53
EU										
Trawl					158	137	104	64	104	63

Survey results indicated a gradual decrease of the stock since about 1988. Although the annual estimates indicated variability, the overall decline appeared to be about 50% (Fig. 11), similar to that indicated by the standardized commercial catch rates.

Length frequencies from the Russian bottom trawl survey indicated a mode at about 15-16 cm that corresponds to the 1990-91 year-classes. These size groups represented about 20% of the research catch in the 1993 survey. These size groups were also dominant in the EU survey results.

In 1993, STACFIS put forth a **recommendation** to present results of length and species composition of catches from midwater trawling conducted to verify acoustic signals during the USSR/Russia trawl-acoustic surveys. The information was not provided at this meeting (see Section VII of this report).

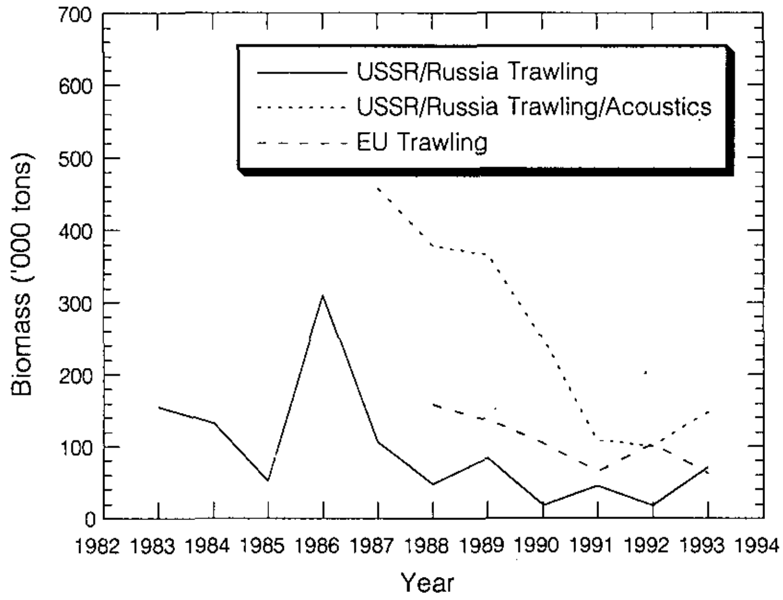


Fig. 11. Redfish in Div. 3M: biomass estimates from research vessel data (USSR/Russia and EU).

c) **Prognosis**

STACFIS concluded that biomass of this stock has declined at least from 1988 to 1991-92. Large catches over the past eight years have likely been well above the stock sustainable production and have resulted in high fishing mortalities. This stock will continue to decline into the future if the present level of catches is maintained. Both Russian and EU surveys indicated a relatively good pulse of recruitment that will start recruiting to the commercial fishery in the late-1990s, however, the abundance of these cannot be precisely determined.

Based on this information, STACFIS **recommended** that *the total catch for redfish in Div. 3M be reduced to 20 000 tons for 1995*. This amount of catch is in the range of catch levels from 1975 to 1985, when stable conditions had been observed in the fishery.

STACFIS noted there continues to be a substantial fishery for shrimp in Div. 3M. Given that significant by-catches of juvenile redfish occur, STACFIS reiterated its concern on the likely negative impact of these shrimp fisheries on future recruitment to the redfish fisheries. STACFIS has only received information on by-catches in the shrimp fishery up to July 1993. While full information for 1993 may be made available when the shrimp resources in this Division will be assessed in September 1994, STACFIS considers that the annual information should be made available in advance of the June meeting when the status of Div. 3M redfish is to be assessed. It is important that information be provided on numbers and sizes of the redfish, as well as weight of the by-catch, and whether or not sorting mechanisms are employed because of the size selectivity of these devices.

7. **Redfish in Divisions 3L and 3N** (SCR Doc. 94/13, 54, SCS Doc. 94/13, 16)

a) **Introduction**

The average reported catch from Div. 3LN from 1959 to 1985 was about 21 000 tons ranging between 8 000 tons and 45 000 tons (Fig. 12). In 1986 the catch of 43 000 tons was double that taken in 1985. The catch increased again in 1987 to the highest recorded historically at 79 000 tons and has since declined substantially. The 1993 catch could not be estimated precisely because of discrepancies in the information from various sources, however, the likely amount is between 18 600 tons and 24 400 tons.

From 1980 to 1985 the former USSR, Cuba and Canada were the primary fleets in essentially a trawler fishery. Canada accounted for most of the Div. 3L catch while the USSR was the dominant fleet in Div. 3N. Over this period catches averaged 19 000 tons and between 60%-80% was taken from Div. 3N. The rapid expansion of the fishery in 1986 was due primarily to the entry of EU-Portugal, taking about 21 000 tons. In addition, in 1987 various countries who were not Contracting Parties to NAFO, most notably South Korea, Panama and Caymen Islands also began to fish in the Regulatory Area accounting for catches of about 24 000 tons. Since then these countries have taken between 4 000 tons and 13 000 tons annually. Information from surveillance sources indicated that during the 1980s most of the Div. 3LN catch was taken in the vicinity of the Div. 3N and 3O border and from the slopes of the Grand Bank in Div. 3L. Since 1990 a considerable amount of activity has occurred on an area known as the 'Beothuk Knoll', which is at the Div. 3L, Div. 3M and Div. 3N border.

From 1980 to 1990 the TAC each year for this stock has been 25 000 tons. The TAC was reduced to 14 000 tons for 1991 and maintained at that level to 1994. The TAC has been exceeded each year for the past 8 years, and in some years catches have been double (1988) and even triple (1987) the agreed TAC.

The fishery is conducted year round in Div. 3L but mostly in the second half of the year in Div. 3N. The bottom trawl is the predominant gear in the fishery.

Recent nominal catches and TACs ('000 tons) are as follows:

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
TAC	25	25	25	25	25	25	25	14	14	14	14
Catch	15	21	43	79[1]	53[1]	34[1]	29[1]	26[1,2]	27[1,2]	19-24[1,2,3]	

[1] Includes catch estimated by STACFIS.
[2] Provisional.
[3] STACFIS could not precisely estimate the 1993 catch but is likely within this range.

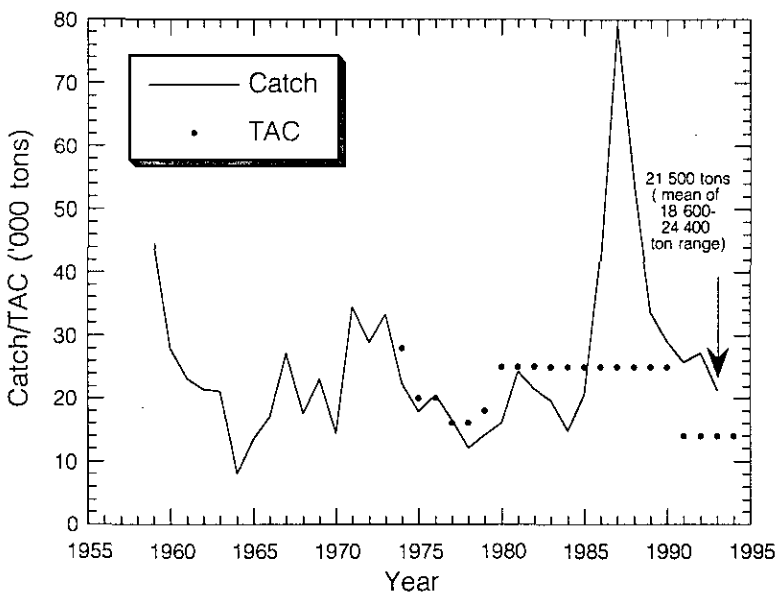


Fig. 12. Redfish in Div. 3LN: catches and TACs.

b) **Input Data**

i) **Commercial fishery data**

A catch-rate database with effort measured in hours fished and another with effort measured in days fished were standardized for each Division separately using a multiplicative model. As in the past these indices were not considered reflective of year to year changes in population abundance (see NAFO Sci. Coun. Rep, 1989, p. 70), although they may be indicative of trends over longer periods of time.

Limited sampling of the commercial fishery, based only on Portuguese samples, indicated the dominant size range was 24-28 cm in January in Div. 3L and 28-33 cm in the second quarter in Div. 3N.

ii) **Research survey data**

Results of bottom trawl surveys for redfish demonstrated a considerable amount of variability. This was realized both between consecutive seasons and years, and amongst standard tow-by-tow catches within a single survey. Nevertheless, Russian bottom trawl surveys conducted from 1984-93 suggested a decline in relative abundance and biomass from 1984 to 1990 in Div. 3L and Div. 3N. There was no survey of these Divisions in 1992. The 1993 survey only partially covered Div. 3L but very low densities were encountered. The 1993 survey in Div. 3N indicated an increase in abundance relative to 1991, however, 70% of the biomass occurred in a single stratum which only represents about 9% of the surveyed area. The decline in Div. 3L was also shown by Canadian surveys over this period. Relative abundance estimates from 1993 Canadian surveys in Div. 3L were at their lowest level since 1978. Canadian surveys in Div. 3N from 1991-93 indicated large fluctuations in relative abundance between seasons within each year but with no trend between years. These were not considered reflective of true changes in population size but rather suggested seasonal changes in either catchability or distribution.

Russian acoustic surveys have been conducted concurrently with the bottom trawl surveys since 1987. In 1993, STACFIS was unable to evaluate these surveys and put forth two **recommendations** to address issues relating to separation of acoustic signals by species and details on vertical and spatial distribution. No information was available at this meeting (see Section VIII of this report).

iii) **Recruitment**

Length and age distributions from Canadian surveys in Div. 3L indicated there has been relatively poor recruitment observed since the early-1980s. Despite this, the 1993 spring, summer and autumn survey catches were dominated by 24-30 cm fish corresponding to the year-classes that were born between 1980 and 1985. Length frequencies and age distributions from the Div. 3N Canadian surveys from 1991-93 show different distributions compared with Div. 3L for each corresponding seasonal survey, consistently being composed of size groups that are much smaller. There was a relatively good pulse of recruitment picked up in the 1991 autumn survey in the range of 12-14 cm (1986 and 1987 year-classes) that could be tracked through to the 1993 autumn survey. Given the variability in the survey estimates the magnitude of this recruitment could not be determined. However, there was no sign of any year-classes subsequent to this in the surveys.

c) **Prognosis**

Russian bottom trawl surveys indicated a decline in relative abundance to low values in recent years for Div. 3L and Div. 3N. The situation in Div. 3L was confirmed in the surveys conducted by Canada. The increase observed in the 1993 Russian survey in Div. 3N occurred in a relatively small area. Canadian surveys in Div. 3N from 1991-93 indicated high seasonal variability. Although a cautious approach should be taken in drawing conclusions about stock status given the inherent variability in bottom trawl surveys, the 1993 Canadian surveys in Div. 3L indicate that relative abundance and biomass are the lowest observed since 1978.

The commercial catch-rate indices derived for Div. 3L and Div. 3N showed much between-year variability. Although some of the changes in mean catch rate between some years were too dramatic to be solely the result of year-to-year changes in population abundance, there were indications of decline since the mid-1980s in all the derived indices. This corresponds to a period when some of the largest catches historically have been taken and have likely generated high fishing mortalities. Although there were increases suggested since 1991 in Div. 3L indices, anecdotal information about the 1994 fishery from Canadian surveillance indicated that most of the Baltic fleets have returned home because of poor catch rates. TACs have been exceeded in each year since 1986 and in some years catches have been double (1988) and even triple (1987) the established TAC. There continues to be a substantial fishery by non-Contracting Parties in the Regulatory Area. Since 1986 catches estimated for these countries have been between 4 000 tons and 24 000 tons.

The information is not sufficient to evaluate where the current TAC (14 000 tons) stands in relation to an appropriate reference catch. Div. 3L appears to be at a relatively low level with the prospect of continuing poor recruitment. Div. 3N shows a year-class of unknown strength that will not be fully available to the fishery until the late-1990s, and there is no sign of good recruitment after this. STACFIS therefore suggests that a cautious approach is warranted in establishing a TAC for 1995. STACFIS considers this resource to be at a low level and that no improvement could be expected as long as catches exceed recommended TACs. STACFIS therefore **recommended** that *for redfish in Div. 3LN catches be reduced and the total catch not exceed 14 000 tons.*

d) **Future Studies**

STACFIS noted that the information available at this meeting was inadequate to address a previous **recommendation** regarding the integrity of Div. 3LN as a separate management unit from adjacent Divisions. STACFIS considered this issue important and necessary to resolve, accordingly, **recommended** that *(1) existing data be examined to evaluate the appropriateness of Div. 3LN and Div. 3O management units for redfish*, and (2) *further examination be conducted of the Russian trawl-acoustic survey data to provide more detail on the location of concentrations of redfish both near the bottom and in the water column in Div. 3LNO.*

8. **Silver Hake in Divisions 4V, 4W and 4X** (SCR Doc. 94/4, 8, 32, 39; SCS Doc.94/3)

a) **Introduction**

The fishery is conducted primarily by large Cuban and Russian otter trawlers using small-meshed bottom trawls. Before 1977 the fishery was not restricted by season or area, however, since 1977 the fishery has been restricted to April 1 through November 15 and to the area seaward of the small mesh gear line (SMGL). Since 1990, allocations have been made to Canadian companies which have entered into developmental arrangements with Cuban and Russian fishing companies to harvest silver hake. Despite these realignments, the resultant composition of the fleet actively fishing silver hake has not changed. Nominal catches since 1970 ranged from a maximum of 300 000 tons in 1973 to a minimum of 29 000 tons in 1993. Catches generally increased, with the exception of 1983, from 1977 to 1989, from 37 000 tons in 1977 to 91 000 tons in 1989. Since 1989, catches have shown a continual decline to levels below those reported in the late-1970s. Since 1977 catches for this stock have been below the total allocated. In recent years this trend has been exacerbated through allocations being made to Canadian interests which did not previously participate in the fishery, and allocations which were made late in the season when commercially viable catch rates could not be achieved.

Recent catches and TACs ('000 tons) are as follows (Fig. 13):

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
TAC	100	100	100	100	120	135	135	100	105	86[1]	30
Catch	74	75	83	62	74	91	69	68[2]	32[2]	29[2]	

[1] Projected catch at $F_{0.1}$ was 75 000 tons; 11 000 additional tons were allocated by Canada in the knowledge that not all allocations would be fully harvested.

[2] Provisional.

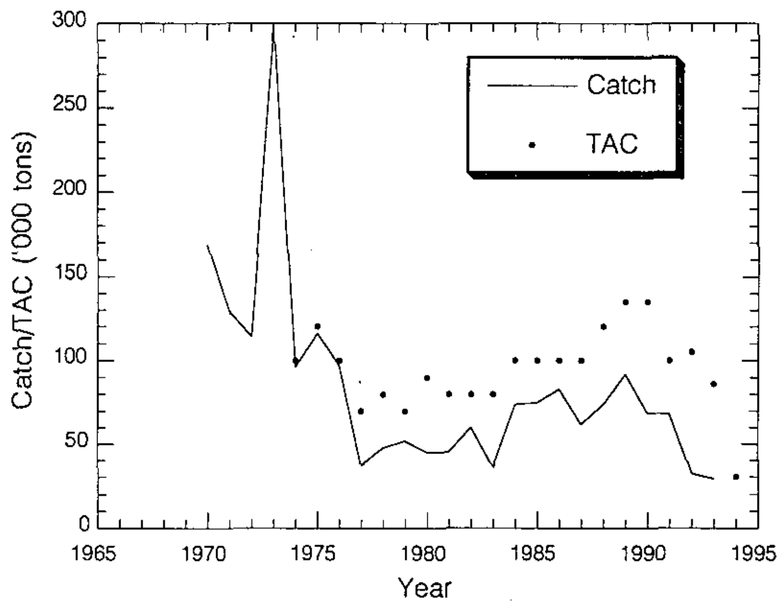


Fig. 13. Silver hake in Div. 4VWX: catches and TACs.

The 1993 fishery commenced in the last week of March, and finished in mid-August. Catch rates were generally poor compared to levels seen between 1985-89, and were about the same as in 1992. Unlike the 1992 fishery however, by-catch of other species did not approach regulatory limits, and was not a restraining factor at any time.

b) **Input Data**

i) **Commercial fishery data**

Catch rates. Catch and effort data from the commercial fishery were analyzed using a multiplicative model to derive a standardized catch-rate series from 1977-93. The model used was simplified over that employed in the previous assessment, in that only country, Division, month and year were considered as factors. The new formulation showed good agreement with that used previously, but explained more of the variation in the data. The standardized catch-rate for this stock had dropped in recent years (Fig. 14), from a peak of 5 tons/hr in 1989 to 1.6 tons/hr in 1992 and 1993. The most recent catch rates were similar to those experienced in the late-1970s and early-1980s.

Catch- and weight-at-age. The commercial removals-at-age for 1993 were calculated from Canadian length samples from the commercial fishery and an age-length key constructed from combined Canada/Russia ageing data. Length/weight data from Canadian July research vessel surveys were used in the calculation of weights-at-age. The removals-at-age and weights-at-age for 1977-92 were taken from the previous assessment, to provide estimates for the period 1977-93, inclusive.

ii) **Research survey data**

The survey results indicated a continual decline in total numbers and biomass over the period 1986-92 (Fig. 15). Results of the 1993 survey indicated both numbers and biomass had risen moderately.

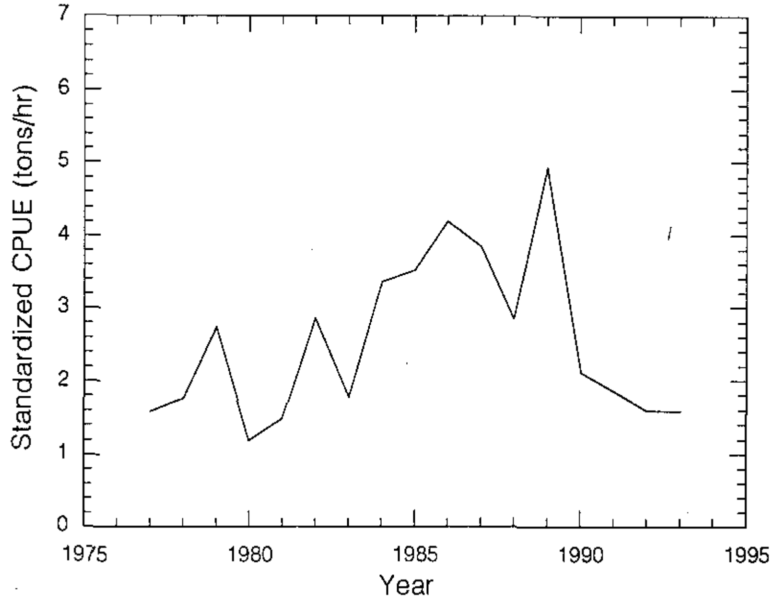


Fig. 14. Silver hake in Div. 4VWX: standardized catch rates.

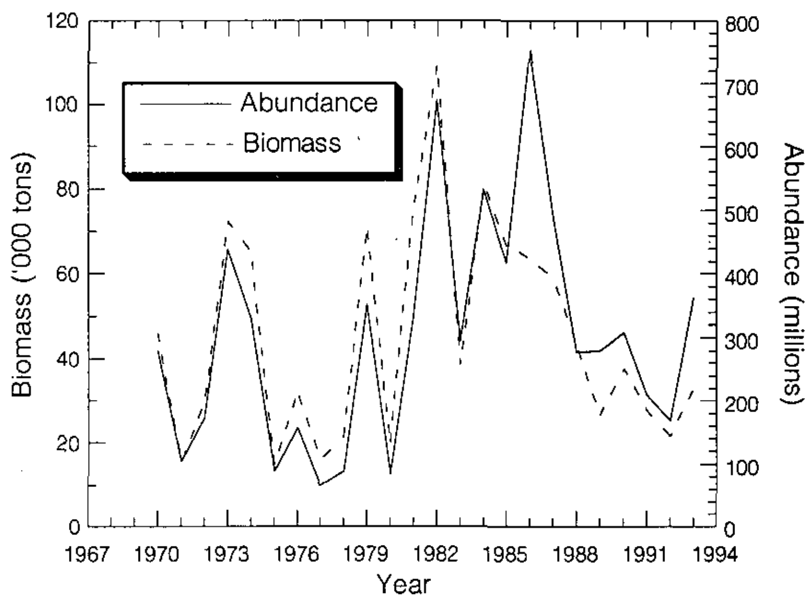


Fig. 15. Silver hake in Div. 4VWX: survey biomass estimates.

The July surveys in 1991 and 1992 showed the 1990 and 1991 year-classes to be below average at ages 1 and 2, and age 1, respectively. The 1993 survey showed higher estimates for these year-classes at age 2 and 3. The 1993 survey also indicated the 1992 year-class is above average. The 1993 silver hake 0-group survey showed the 1993 year-class should be about average in size.

iii) **Biological studies**

One paper was presented which investigated the distribution of silver hake and zooplankton with water temperatures on the Scotian Shelf in 1990 (SCR Doc. 94/4). During summer silver hake were found to be aggregated on the warm side of the hydrological front in temperatures between 7° and 10.5°C. While statistical correlations were low, silver hake showed a tendency to be found in association with euphausiids rather than calanoid zooplankton.

c) **Estimation of Parameters**

i) **Sequential population analysis**

Commercial catch-at-age (ages 1-9, 1977-93), age disaggregated standardized CPUE (ages 1-9, 1977-93), Canadian July survey catch-at-age (ages 1-9, 1977-93) and a juvenile index (0-group, 1981-93 except 1992) were used for tuning in the same Adaptive framework (ADAPT) as was employed in the September 1993 assessment. A dome-shaped partial recruitment pattern was used in the analysis, and M was set at 0.4.

An analysis using the Laurec-Shepherd technique was also conducted. The results of the two analyses corresponded closely.

High negative residuals were noted for the 1977, 1978 and 1993 estimates from both July research vessel and CPUE indices. Further, the CPUE estimates for 1989 had high positive residuals. These observations supported the conclusion that the data did not fit the model well.

Two papers examined variability trends in population size for this stock. SCR Doc. 94/8 noted the low variability in stock size since 1977, and suggested this may result from a tendency of the ADAPT technique to under-estimate stock size in years of high abundance. Relationships between recruitment indices were examined in SCR Doc. 94/39. The 0-group survey was shown to provide an index of pre-recruitment strength that was well correlated with SPA year-class abundance estimates. However, biases in the relationships between recruitment indices (0-group and age 1) and SPA resulted in the overestimation of poor year-classes and the under-estimation of large year-classes. This was attributed to mis-assignment of ages in the calculation of annual removals-at-age, resulting in a smoothing of year-class strength estimates. This could also account for the low variability in stock size estimates noted in SCR Doc. 94/8.

A retrospective analysis using the results of the ADAPT formulation on ages 3-5 showed a pattern where F was consistently underestimated (by 40-60%) as a longer time series of data was introduced. This retrospective pattern had been noted in other North Atlantic groundfish stocks, however, the underlying cause remained obscure. The high negative residuals seen from both July research vessel and CPUE indices in 1993 indicated the most recent year did not fit the model well. Under these circumstances, it was reasonable to assume that the 1993 fishing mortality produced by ADAPT was also underestimated.

d) **Prognosis**

The 1993 year-class will make a significant contribution to the catch in 1995 at age 2. Based on the 1993 0-group survey, this cohort was estimated to be average in size at 1.1 billion fish. The size of the 1992 year-class at age 1 was poorly estimated in the SPA, as the estimate is based on a single occurrence in the catch matrix. While it was decided to accept the estimates of the 1991 and earlier year-classes as given by the SPA, the strengths of the 1992 year-class was inferred from July survey data. Year-class estimates from the research vessel survey were regressed against estimates from the SPA for the 1982-91 year-classes at age 1, using the model SPA = a + b(ln RV); $r^2 = 0.72$. Prediction from this relationship for the strength of the 1992 year-class was 1.2 billion fish. An $F_{0.1}$ value of 0.70 was calculated using a Thompson-Bell yield-per-recruit model. The mean weights-at-age and partial recruitment pattern for projection were taken as the average of recent years (1989-93) observed in the fishery and the SPA. Weight and PR-at-age used were as follows:

Age	Avg weight (kg)	PR
1	0.062	0.02
2	0.133	0.30
3	0.182	0.73
4	0.211	1.00
5	0.254	0.96
6	0.308	0.89
7	0.399	0.47
8	0.431	0.34
9	0.717	0.08

Mean weight-at-age from the commercial fishery showed a marked drop in 1993 over previous years. This change was attributed to the length/weight relationship derived from the July RV data. Possible reasons for the low weight-at-length were investigated, and it was judged to be an artifact.

As the 1994 fishery was still in progress, the exact catch could not be known at time of this meeting. Based on preliminary catch rates, level of participation and the late start of the fishery in 1994, the final catch was predicted to be 15 000 tons. A catch of this size will result in a fully recruited fishing mortality of F = 0.13. The catch at a target fishing level of $F_{0.1}$ in 1995 is estimated to be 79 000 tons.

The retrospective analysis indicated a consistent tendency to overestimate the stock size when additional years of data were added. This suggests that the abundance of year-classes estimated by ADAPT for 1993 may have been overestimated. These are the 1991 and older year-classes which will be ages 4 and older in 1995. These ages account for about 43% of the projected catch in 1995. In addition, a review of historical TAC advice indicated that since about 1984, the projected $F_{0.1}$ catches from the assessments have been overestimated. It is expected that the calculated stock size at the beginning of 1994 is also an overestimation. Projections suggest that the catch at $F_{0.1}$ in 1995 of 79 000 tons could be an overestimated by as much as 20 000 tons.

e) **Future Studies**

STACFIS continues to support cooperative studies on silver hake. These include continuation of the joint Canada-Russia juvenile survey, which is noted as a critical element in the prediction of incoming year-class size for this stock.

Further investigation into approaches which might explain the retrospective problem is encouraged. This is, of course, not an issue which concerns only silver hake but is central to improvement of many stock assessments.

9. **American Plaicé in Division 3M** (SCR Doc. 94/22, 61; SCS Doc. 94/3; 13; 16)

a) **Introduction**

Since 1974, when this stock started to be regulated, reported catches ranged from 600 tons in 1981 to the highest value of 5600 tons in 1987. After that catches declined drastically to 275 tons in 1993. Reported catches for 1993 are 456 tons, but estimated catches from Canadian surveillance and other sources suggested 275 tons as a more realistic value.

The observed reduction in the catches in the last two years was due in part to the shift in the target species to Greenland halibut for the Spanish fleet.

Since 1979 a TAC of 2 000 tons has been agreed for this stock. For 1994 a reduction to 1 000 tons was agreed (Fig. 16).

Recent TACs and catches ('000) are as follows:

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
TAC	2	2	2	2	2	2	2	2	2	2	1
Catch	1.3	1.7	3.8	5.6	2.8	3.5	0.8	1.6[1]	0.8[1]	0.3[1]	

[1] Provisional.

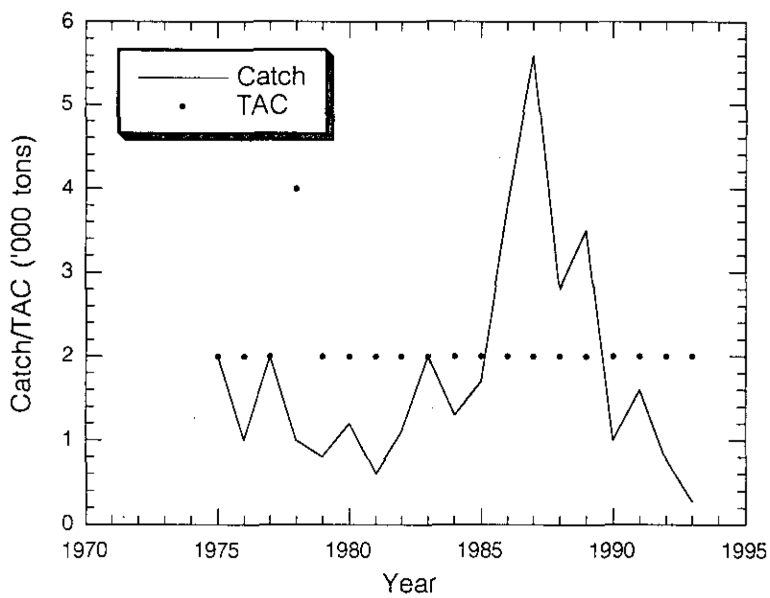


Fig. 16. American plaice in Div. 3M: catches and TACs.

b) **Input Data**

i) **Commercial fishery data**

Length compositions of the 1993 catch were available for Spanish small-freezer trawlers and pair-trawlers. A limited sample was also available from Portuguese gillnetters. Age-length keys for the commercial fishery were available from EU-Spain.

Small-freezer trawler length frequency data ranged between 21-60 cm with a peak at 40 cm. The pair trawler catches were dominated by fish with length between 29 and 62 cm with a main peak at 40 and another at 50 cm. Ages 5 to 7 were dominant in the catches. However, there were discrepancies between catch-at-age from the commercial catches and survey data, where ages 5 and 7 were less represented, possibly because the otolith readers were not the same for the survey and for the commercial catches. Mean weights-at-age in the catch showed no trend in the observed period.

ii) **Research survey data**

Research surveys were conducted by the EU and Russia in 1993. From the EU survey, biomass continued to decrease from 6 492 tons in 1992 to 5 949 tons in 1993 (see text Table below; Fig. 17) and abundance followed a similar decrease from 10.4 million in 1992 to 9.3 million in 1993. From the Russian surveys, an opposite tendency was observed. Biomass increased from 1 000 tons in 1992 to 2 700 tons in 1993, and abundance also increased from 1.5 million in 1992 to 3.6 million in 1993. Differences in the mean weight-per-fish in both surveys were detected, but these differences did not follow the same pattern in the series. The Russian survey was more variable but the 3 lowest values were 1990, 1992 and 1993.

The American plaice abundance ('000) and biomass (tons) in the surveys were as follows:

Year	EU		USSR/Russia	
	Number	Biomass	Number	Biomass
1983				8 900
1984				7 500
1985				7 800
1986				20 200
1987				9 300
1988	21 219	11 868	10 000	6 500
1989	20 500	10 533	8 300	5 000
1990	16 631	9 101	2 600	1 200
1991	13 932	7 565	12 700	14 400
1992	10 363	6 492	1 900	1 000
1993	9 268	5 949	3 600	2 700

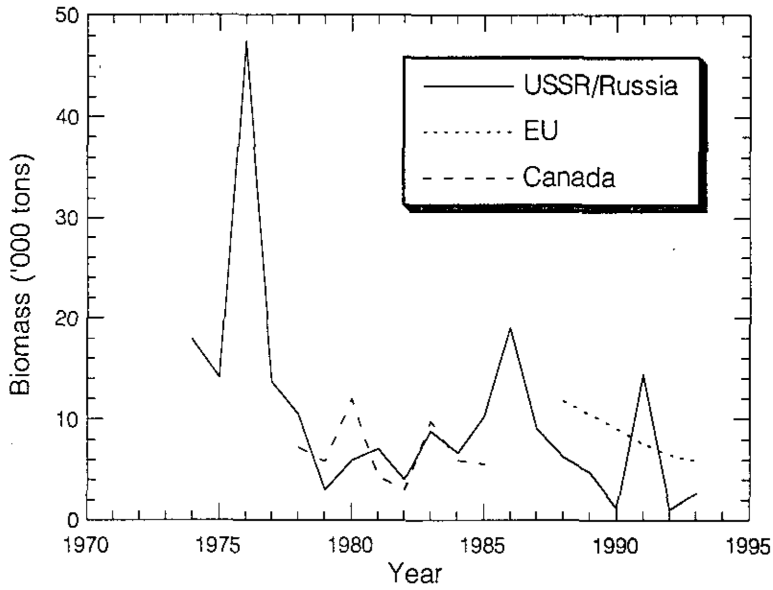


Fig. 17. American plaice in Div. 3M: biomass estimates from surveys.

Age composition was dominated by the 1986 year-class at age 7, which should be fully recruited to the fishery in 1994. The 1990 year-class that appeared in 1992 as the second most abundant at age 2 since 1988, also appeared in 1993 as the second most dominant at age 3. The 1991 year-class appeared to be very weak at age 2. In the 1993 survey there appeared to be an inconsistency compared with previous surveys, with ages 12 and older seeming to be more abundant in 1993. This could possibly be due to the change in the otolith reader.

The spawning stock biomass (50% of age 5 and 100% of age 6+), as estimated from the EU surveys, increased in 1993 to a value close to the 1990-91, due to the recruitment of the 1986 year-class.

c) **Estimation of Parameters**

The catch-at-age matrix was updated with data of 1993 using the length and age composition available from the commercial catches and the age-length key from the Spanish commercial catches. This matrix was checked by the sum of products and adjusted to the catches.

In order to get an overall view on the situation in the most recent period, last year a catch curve was constructed using 1988-90 age distribution of the catches. In this curve, ages 8 to 11 appeared to be fully recruited to the fishery, and from this catch curve, the partial recruitment vector was estimated. The mean F for this period for these ages was estimated to be 0.53. The partial recruitment vectors are as follows:

Ages	3	4	5	6	7	8	9	10	11	>11
PR	0.03	0.07	0.2	0.4	0.6	0.99	1	1	1	1

The estimation of F was done with the same method used in the 1993 assessment. This method provides biased estimates when the catchability of the survey changes with age. However these biases were not very large (SCR Doc. 94/61) and the estimates of F were used to indicate an overall trend and general levels. The estimated values are:

Derivation of fishing mortalities estimated from ages 8-11 for the period 1988-90 and annual Fs for the period 1988-93.

	Biomass 8-11			
Year	survey	catch	C/B	F
1988	6 066	1 298	0.21	0.41
1989	2 573	1 470	0.57	1.10
1990	3 262	497	0.15	0.29
1991	2 481	768	0.31	0.60
1992	2 141	435	0.20	0.39
1993	1 075	111	0.10	0.20
1988-90	11 901	3 265	0.27	0.53

$q = 0.518830$

Although the value of F for 1993 could be an overestimation due to the fact that the distribution of ages 8-11 in the survey appeared to contribute to a wider range of ages in the 1993 survey than in previous surveys, a drastic decrease in F from the high value of 1989 to the value estimated for 1993 was obvious. This was consistent with the shift towards deeper water (toward other species) which occurred in this fishery in 1992. The fishing mortality found in 1993 was approximately equal to the natural mortality.

d) **Prognosis**

STACFIS noted that despite the high variability in the Russian research survey results, it appeared that the stock had steadily declined in recent years. It is believed that this decline was due to excessive fishing mortality at least in the period 1988-91. In order to halt the decline of the stock, STACFIS **recommended** that *the catch of American plaice in Div. 3M should not exceed 1 000 tons in 1995.* This corresponds to the expected by-catches in non-directed fisheries.

10. American Plaice in Divisions 3L, 3N and 3O (SCR Doc. 94/55, 56, 58; SCS Doc. 94/13, 16)

a) Introduction

The catch in 1993 of 17 257 tons was up almost 5 000 tons from the 1992 level, which was the lowest since the 1950s. The increase was due to a rise in catches by non-Contracting Parties to about 9 000 tons in 1993. Catches by non-Canadian fleets in 1993 were similar to the 1990 and 1991 values, after declining in 1992. The Canadian catches continued to decline from around 23 000 tons in 1990-91 to 7 600 tons in 1993. As in 1992, most of the Canadian catch was taken by otter-trawl in Div. 3O. The Canadian otter-trawl catch in Div. 3L, which ranged from 14 000 tons to 32 000 tons during 1975-89, declined to only 6 tons in 1993.

It was again obvious that catch statistics for this stock are not adequate. In some years, a substantial portion of the catch is estimated or determined by breaking down the unspecified flounder catches. This situation was worse for 1993 when about 50% of the total catch was based on Canadian surveillance estimates.

Recent nominal catches and TACs ('000 tons) are as follows (Fig. 18):

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
TAC	55	49	55	48	40[1]	30.3	24.9	25.8	25.8	10.5	4.8[2]
Catch	39[3,4]	54[3,4]	65[3,4]	55[3]	41[2,4]	44[3,4]	32[3,4]	34[4,5]	13[4,5]	17.3[5,6]	

[1] Although the TAC was set at 40 000 tons, Canada reduced its domestic quota to 33,000 tons, therefore the effective TAC was 33 585 tons.
[2] No directed fisheries allowed.
[3] Includes a percentage of the "flounder non-specified" catch reported to NAFO by South Korea.
[4] Includes estimates of misreported catches.
[5] Provisional.
[6] Catch may be as high as 19 400 tons.

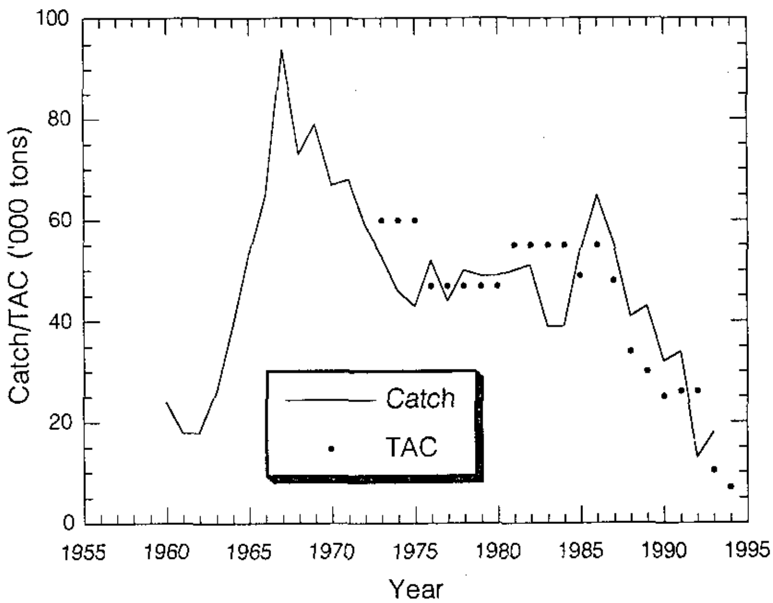


Fig. 18. American plaice in Div. 3LNO: catches and TACs.

b) **Input Data**

i) **Commercial fishery data**

Catch and effort. Data from the Canadian commercial fishery in Div. 3LNO from 1956 to 1993 were analyzed using a multiplicative model to obtain a standardized catch-rate series (Fig. 19). The data were from Canadian trawlers, tonnage classes 4 and 5, and the same procedure was followed as in the recent assessments of this stock. The decline in catch rates which started in 1991 continued and in 1993 were 75% below the relatively stable level of 1986-90. CPUE in 1993 was the lowest on record. The declines in CPUE in 1991-93 were seen in all three Divisions. Given the major distributional changes in the fishery after 1990, it was recognized caution should be exercised in evaluating the results of the catch rate analyses. However, it was clear that catch rates of American plaice in the Canadian fishery in all areas of the Grand Bank in 1993 were well below any observed in the 38 year time-series for this fleet.

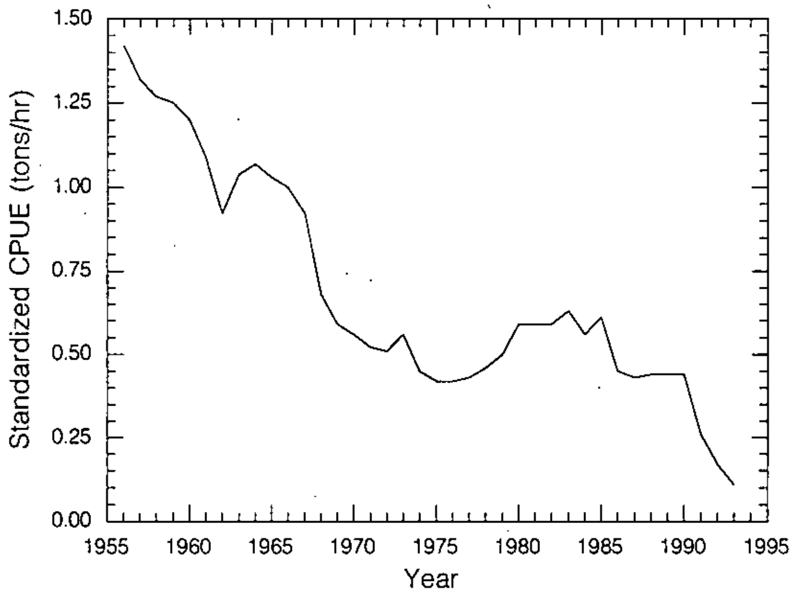


Fig. 19. American plaice in Div. 3LNO: standardized catch rates.

Limited data from the Portuguese otter-trawl fishery showed that CPUE in Div. 3N in 1993 was double the 1992 level, and was the highest since 1990.

Catch-at-age and mean weights-at-age. Sampling data were available from the Canadian, Spanish, and Portuguese fisheries in 1993. Ages 7-10 comprised the majority of the Canadian catches, with the peak at age 8, compared with a peak of 9. The mean weights were higher at most ages in 1993 compared to 1992, which may reflect the higher proportion of the catch from Div. 3N in 1993.

Length compositions from the Spanish and Portuguese fisheries in Div. 3N were converted to age compositions using age-length keys from the Portuguese fishery and the Canadian research vessel surveys. These catch-at-age data indicated that the peak was at age 8 in 1993, agreeing with the Canadian fishery data. This was also the same cohort which dominated catches in the Regulatory Area from 1989 to 1992. The mean weights-at-age in 1993 were lower than those observed in the Canadian fishery, and lower than those observed in the Spanish and Portuguese fisheries in 1992.

STACFIS noted that it was not possible to calculate an age composition for the total catch in 1993 because catches by non-Contracting Parties, which accounted for 50% of the catch, did not have sampling data, and were thought to catch a greater proportion of small fish than other fleets in the fishery.

ii) **Research survey data**

Canadian stratified-random groundfish surveys. Data from spring surveys (Fig. 20) in Div. 3L, 3N and 3O were available from 1971 to 1993, excluding 1983 in all areas and 1971, 1972 and 1974 in Div. 3O. Age-by-age abundance estimates for Div. 3L, 3N and 3O were available from 1971-93, but only preliminary estimates of biomass were available from the 1994 survey.

In Div. 3L, the trawlable biomass index was highest from 1978-82, declined to a lower but stable level from 1985 to 1988, then declined by 35% or more in each year from 1989 to 1994, and is currently at a level of only about 3% of the 1985-88 mean value. In Div. 3N, the trawlable biomass index also showed a decline in recent years, with 1992 and 1994 being the lowest points by far in the series, about 55% lower than the 1993 value. In Div. 3O, the biomass index showed a consistent decline since 1990, with the 1994 value being the lowest in the series, down 30% from the previous low in 1993.

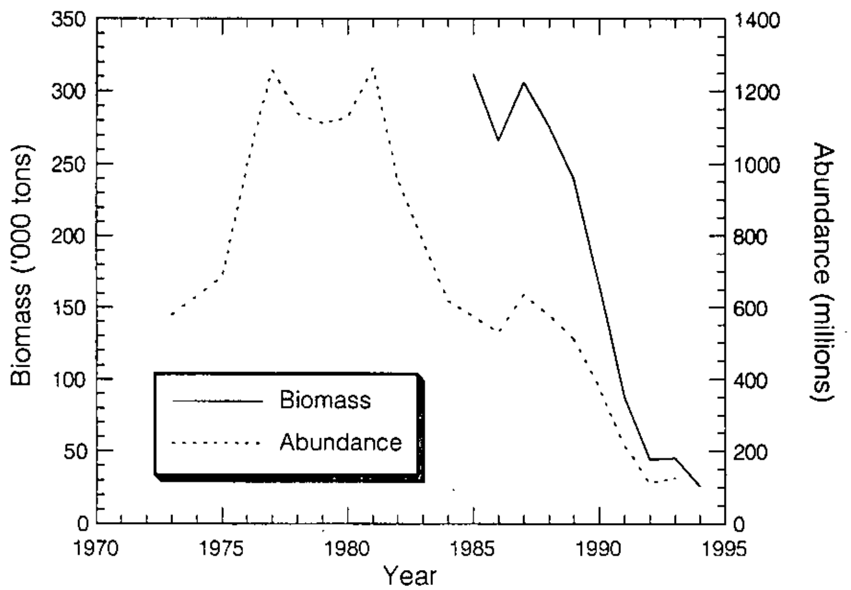


Fig. 20. American plaice in Div. 3LNO: biomass estimates from Canadian spring surveys.

In all areas, the trawlable abundance was generally highest in the late-1970s and early-1980s as the strong year-classes of the early-1970s dominated survey catches. Abundance in 1992 was much lower than in any other year, having declined by about 45% in each of 1991 and 1992 to a level which was only 10% of peak estimates in the late-1970s and early-1980s. The total abundance index for 1993 was 13% higher than in 1992 and was the second lowest estimate in the series. In Div. 3L the decline was worse, with abundance in 1992 being only 3% of the peak abundance in the 1977-80 period. The abundance in Div. 3LNO at each age over 3 years was the lowest ever observed for some ages in 1992 and all other ages in 1993, in most cases by a wide margin. In the late-1970s, fish aged 9 years and older, which represented an approximate measure of spawning stock numbers, made up 35 to 45% of the abundance index. By 1993, fish in these age groups made up only 20% of the index, and the estimates of abundance at these ages had declined by about 95% during this period.

STACFIS noted that from 1975 to 1987, the abundance estimates on a cohort increased each year between ages 7 and 8, indicating that the fish at age 7 were recruited less to the survey trawl than fish at age 8. Since 1987, the estimates of every cohort have decreased between ages 7 and 8, which indicated a sudden increase in mortality. An analysis of total mortalities-at-age (Z values) indicated steadily increasing Zs at most ages in Div. 3L in recent years, and that Zs at ages 8+ were often above 1.0. The same increasing trends were not visible at all ages in Div. 3N and 3O, although Zs around 1.0 were not uncommon at the older ages in both datasets.

From Canadian autumn surveys (Fig. 21) in Div. 3L, population estimates have shown a sharp downward trend since 1984 to a level in 1993 which is only 8% of the estimates in the early-1980s. Similar to the spring surveys, the 1993 abundance estimates at every age older than 4 years were the lowest in the series.

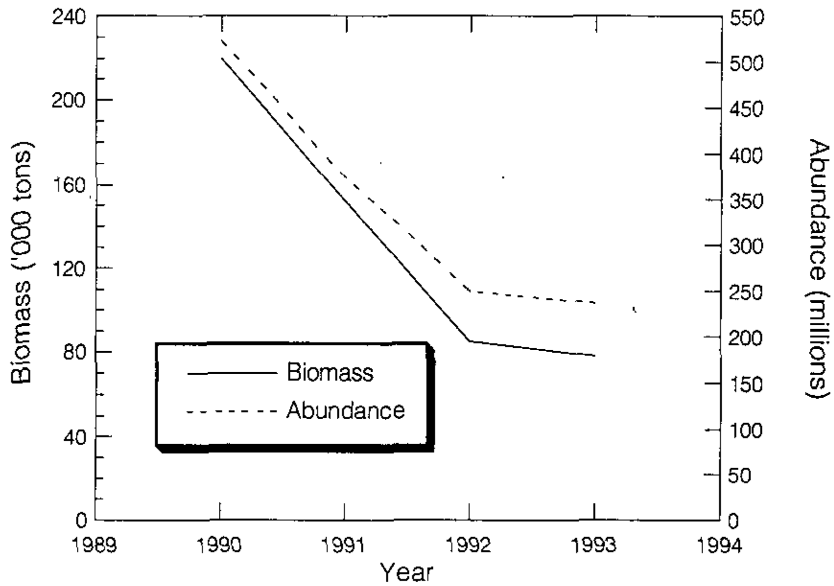


Fig. 21. American plaice in Div. 3LNO: biomass estimates from Canadian autumn surveys.

From 1990 to 1993, autumn surveys were also carried out in Div. 3NO. The index of total abundance for Div. 3LNO increased between spring and autumn in each year, with the increase ranging from 40 to 125%. This spring to autumn increase had not been observed consistently in Div. 3L in other years and could not be explained. As well, the estimates of total abundance from the autumn surveys in Div. 3L had declined by 30% or more in each of the last 3 years, while there has been no trend in either Div. 3N and 3O. For Div. 3LNO in total, the autumn surveys indicated a decline in abundance of 55% from 1990 to 1993, compared to a decrease of 67% during this period in the spring surveys.

The 1986 and 1987 year-classes made up about 40% of the total abundance index in the both the spring and autumn surveys in 1993.

Canadian juvenile groundfish surveys. Stratified-random surveys of Div. 3LNO were conducted inside the 91 m depth contour from 1985 to 1988 and were extended to 183 m in the 1989 to 1991 surveys, and to 273 m in the 1992 and 1993 surveys. In 1993, large catches of juveniles were taken in the Regulatory Area in Div. 3NO, consistent with previous surveys. Two other sites were identified as areas of major concentrations of juveniles: the Whale Deep area in Div. 3O, and the north and northeast slope of Div. 3L. Although the areas of concentration of juvenile American plaice were fairly localized, the distribution of adults was more widespread and there was considerable overlap between the distributions of adults and juveniles, similar to other years. American plaice were generally found in deeper and colder water in Div. 3L than in Div. 3NO.

In Div. 3L, the total abundance was relatively stable from 1989 to 1993, however, the biomass had continued to decline since 1990, and in 1993 was 25% lower than the 1992 estimate. In Div. 3N, total abundance and biomass increased in 1993 by about 50%, however, STACFIS previously noted (NAFO Sci. Coun. Rep., 1993) that the 1992 abundance estimate was likely biased downward as a result of an unusual random allocation of sets in a stratum (360) with historically high abundance. In Div. 3O, total abundance and biomass were similar to the 1992 estimates. No age data were available from the 1993 survey.

USSR/Russian surveys. Results from USSR/Russian surveys in Div. 3LNO were available for 1972-91, but no comparable survey was done in 1992 and the 1993 results were not available at this meeting. STACFIS recognized the importance of the Russian spring survey data in providing an index of abundance for this stock and **recommended** that *the estimates from the 1993 and 1994 USSR/Russian surveys be made available in June 1995 if possible.*

iii) **Biological studies**

Maturity-at-age was calculated for each Division and sex for 1971 to 1993. Age, maturity and length frequency data collected from Canadian spring research vessel surveys were analyzed. For females, the combined Div. 3LNO estimate of the age at which 50% of the fish are mature (A_{50}) showed a decline from a mean of 10.6 years in 1975-82 to a mean of 8.4 years since then. In Div. 3N and 3O, estimates of A_{50} have shown signs of increasing in recent years but there was no similar trend in Div. 3L. For males the combined Div. 3LNO estimates of A_{50} were 6.0 years old in 1975-82 and 4.8 years in 1984-93, with the largest decline occurring in Div. 3L.

The estimates of A_{50} of both the male and female in Div. 3LNO were significantly correlated with the Div. 3LNO age 5+ biomass estimate from the Laurec-Shepherd analysis in the 1993 assessment, using the Spearman rank correlation. The A_{50} estimates for males and females in Div 3L and 3N were significantly correlated with RV abundance estimates, but those for Div 3O were not.

Because it was not possible to separate the SPA population numbers-at-age by sex for this assessment, the maturity ogives at age could not be applied to the population estimates. The assumption in recent assessments, that age 9+ represented spawning stock was considered to be probably reasonable, as this was close to the mean of the female A_{50} estimates. However, the maturity ogives should be used in future calculations of spawning stock biomass if possible, given the trends indicated in these data.

c) **Estimation of Parameters**

i) **Sequential population analysis**

STACFIS concluded that deficiencies in catch-at-age for 1993 as discussed above precluded the use of catch-at-age for 1993 in any SPA-based models. It was also noted that the 1993 assessment pointed out several problems with recent SPA-based assessments for this stock, most noticeably the low level of confidence in the catch and catch-at-age in many years, the lack of fit indicated by the models in recent years, and the severe bias seen in the retrospective pattern in estimates of stock size and fishing mortality in consecutive assessments.

d) **Assessment Results**

STACFIS concluded that the stock had declined rapidly and substantially from the mid-1980s to the present, and it was clear that the stock was at a record low level. Total mortality had been high in recent years, although it was not clear if its recent increases in all areas could be fully attributed to the fishery.

e) **Prognosis**

American plaice in Div. 3LNO was currently at a level far below historic values (Fig. 19 and 20) The SSB was at an extremely low level and will not improve if exploitation of recruiting year-classes occurs. Given the magnitude of the rapid declines indicated by the survey data, it was not clear if this decline will be halted even in the absence of directed fisheries. Given the extremely low population size in 1993, concerns about the SSB, and the expectation of very poor recruitment, STACFIS **advised** that there be no fishing on American plaice in Div. 3LNO in 1995. Prospects for rebuilding the stock remain unclear, as there are no data to suggest that this stock has ever been at such a low level before.

11. **Witch Flounder in Divisions 3N and 3O** (SCR Doc. 94/49; SCS Doc. 94/12, 13)

a) **Introduction**

Reported catches in the period 1970-84 ranged from a low of about 2 400 tons in 1980 and 1981 to a high of about 9 200 tons in 1972. With increased effort, mainly by EU-Spain and EU-Portugal in 1985 and 1986, catches rose rapidly to 8 800 and 9 100 tons, respectively. This increased effort was concentrated mainly in the Regulatory Area of Div. 3N. Non-Contracting Parties such as South Korea (Contracting Party as of December 1993), Cayman Islands, Panama and USA also contributed to the increased catches.

Recent TACs and catches ('000 tons) are as follows (Fig. 22):

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
TAC	5	5	5	5	5	5	5	5	5	5	3[1]
Catch	3	9	9	8	7	4	4	5[2]	5[2]	4[2]	

[1] No directed catch.
[2] Provisional.

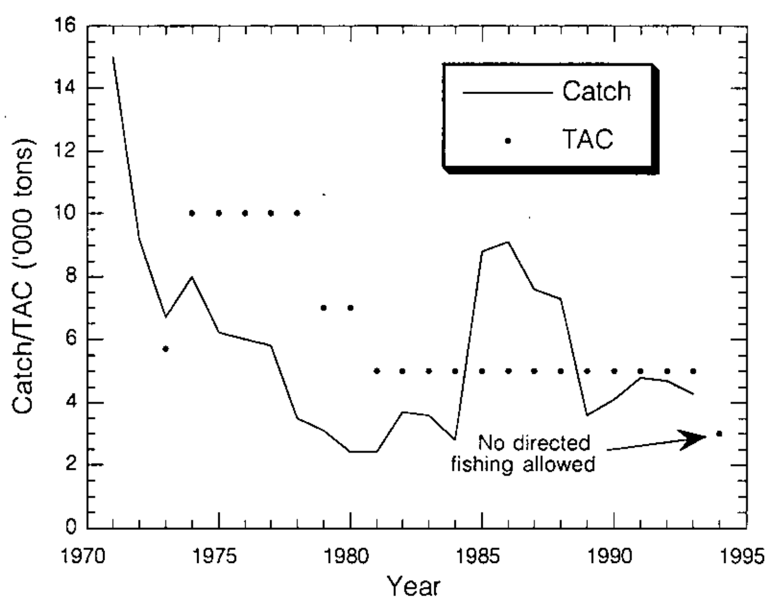


Fig. 22. Witch flounder in Div. 3NO: catches and TACs.

In 1987 and 1988, the total catch was about 7 500 tons, declining to between 3 700 and 4 900 tons in 1989 to 1992 with a catch of 4 400 tons estimated for 1993. Catches by Canada ranged from 1 200 tons to 4 900 tons in recent years (about 2 650 tons in 1991 and 4 300 tons in 1992) and were mainly from Div. 3O. Catches by USSR/Russian vessels declined from between 1 000 and 2 000 tons in 1982-88 to less than 100 tons in 1989-90, and to 0 in 1991 to 1993.

STACFIS noted catch statistics are not adequate for this stock, given that there are catches by non-Contracting Parties which are not reported to NAFO (greater than 30% for 1991 and 1992) and are only estimated from surveillance reports. There are also catches which must be estimated from breakdowns of unspecified flounder catches.

b) **Input Data**

i) **Commercial fishery data**

Catch rates. The catch/effort data from the Canadian fleet fishing mainly in Div. 3O were analyzed with a multiplicative model to derive a standardized catch-rate series for hours fished.

The regression was significant ($p < 0.05$), explaining 76% of the variation in catch rates. The analysis indicated very little in the way of trends, however, the most recent three data points were relatively stable at the lowest level in the time series. From the analysis it was evident that the best time of the year for fishing witch flounder is in the late-winter and early-spring. It was recognized, however, that fishing during this period is on prespawning concentrations when fish are highly aggregated and as such these catch rates might be more representative of density rather than stock size. Consequently, when catch rates are at a very low level such as those of recent years it was felt it could be an indication of a seriously depleted stock.

Catch-at-age. Data were available from the Canadian commercial fishery from 1979-93. The age structure in this fishery (almost entirely in Div. 3O) was very stable over the time series ranging from age 5 to age 16 with most of the catch coming from ages 9-12, with some slight increase in the younger ages in the more recent years. It is known, however, that historically the fishery occurred primarily in winter-spring on pre-spawning concentrations comprised of larger fish. Recently, besides fishing pre-spawning concentrations, the fishery was spread to other seasons probably over a wider range of sizes which may explain these differences. Mean weights-at-age data from the commercial fishery in recent years showed a slight increase in the major age groups which might also reflect a change in fishing strategy.

ii) **Research survey data**

Biomass estimates. Estimated biomass from Canadian surveys in Div. 3N has been at very low levels during 1971-94 and in most years was less than 1 000 tons (Fig. 23). For Div. 3O the estimates of biomass fluctuated annually, on average between 6 000 and 12 000 tons particularly in the late-1980s. It was observed that despite the fact that survey coverage during 1991-93 has been the most complete in the time series, including much deeper water, there was a sharp declining trend since 1989 with the 1993 value (1 500 tons) approximating the lowest observed in the time series. The preliminary estimate from the 1994 Canadian spring survey indicated a biomass of about 6 600 tons. The significance of this increase from 1993 can not be evaluated until distribution of the survey catches can be examined.

Age composition. The age structure for the years from both the spring 1984-93 and autumn (1990-93) surveys in Div. 3O (data from Div. 3N insufficient) indicated that the age structure was quite similar to that from the Canadian commercial fishery.

c) **Prognosis**

The biomass in Div. 3N has been and continues to be quite low and the catch in this Division in 1993 was very low compared to previous years. Most of the stock is located in Div. 3O.

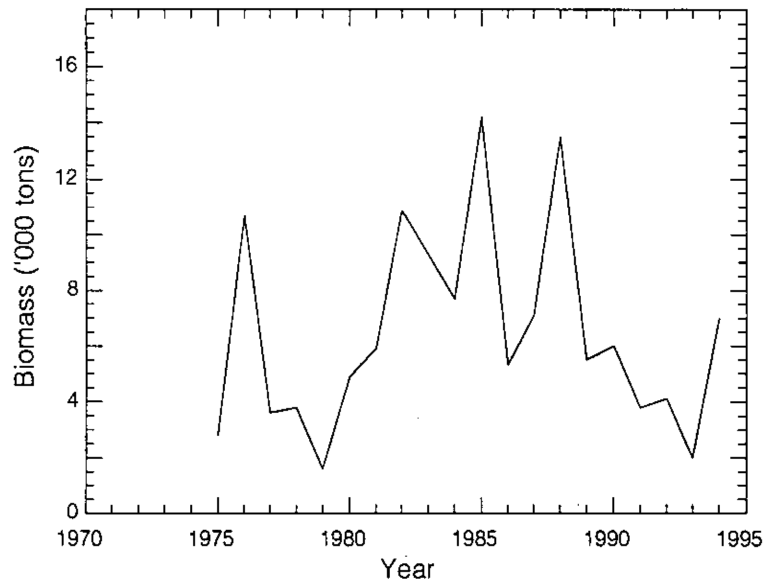


Fig. 23. Witch flounder in Div. 3N and 3O: biomass estimates from Canadian surveys.

The estimated trawlable biomass during most of the 1980s in Div. 3O would suggest stability in the range of 6 000 tons, assuming that the 1985 and 1988 (and now possibly 1994) points are due to an artifact of fish moving in over the Bank and occupying large strata, and resulting in estimates that may be biased upwards. In 1992, STACFIS noted that there were some signs to suggest that the stock had declined. Since 1990, there has been evidence of a sharp decline in biomass in Div. 3O. This decline has continued and the 1993 values are near the lowest observed in the time series. This is of particular importance since the last four surveys have covered a much more extensive depth range.

Based upon the data presented here, it is considered that the assessment mainly reflects stock status in Div. 3O. If the biomass trajectory of the recent period is correct it indicates that recent catch levels in this Division are too high. Given the current assessment STACFIS **advised** that there should be no fishing on witch flounder in 1995 in Div. 3N and 3O to allow for rebuilding of this stock to former levels.

12. **Yellowtail Flounder in Divisions 3L, 3N and 3O** (SCR Doc. 94/44, 46, 58)

a) **Introduction**

Nominal catches increased in 1993 by about 3 000 tons to around 13 600 tons. The main reason for the rise in 1993 was an increase in the catch of non-Contracting Parties. The Canadian catches have been stable from 1991 to 1993 at about 6 700 tons per year. Catches by EU vessels were at very low levels in 1992 and 1993, and catches by South Korea declined from 3 800 tons in 1992 to 0 in 1993. Catches exceeded the TACs in each year from 1985 to 1993.

As noted in previous reports of Scientific Council, catch statistics for this stock are not adequate, with as much as 25% of the catch in some years in the mid-1980s coming from surveillance estimates and categorization of unspecified flounder catches. About 33% of the 1991 catch was estimated, but this situation was much worse in 1993, when approximately 50% of the catch was derived from surveillance reports. STACFIS noted that the total catch in 1993 may have been 200 tons higher than the figure of 13 600 tons agreed to.

Recent TACs and catches ('000 tons) are as follows (Fig. 24):

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
TAC	17	15	15	15	15	5	5	7	7	7	7[1]
Catch	17[2]	29[2]	30[2]	16	16[2]	10[2]	14[2]	16[2,3]	11[3]	14[2,3]	

[1] No directed fishing allowed.
[2] Includes estimates of misreported catches.
[3] Provisional.

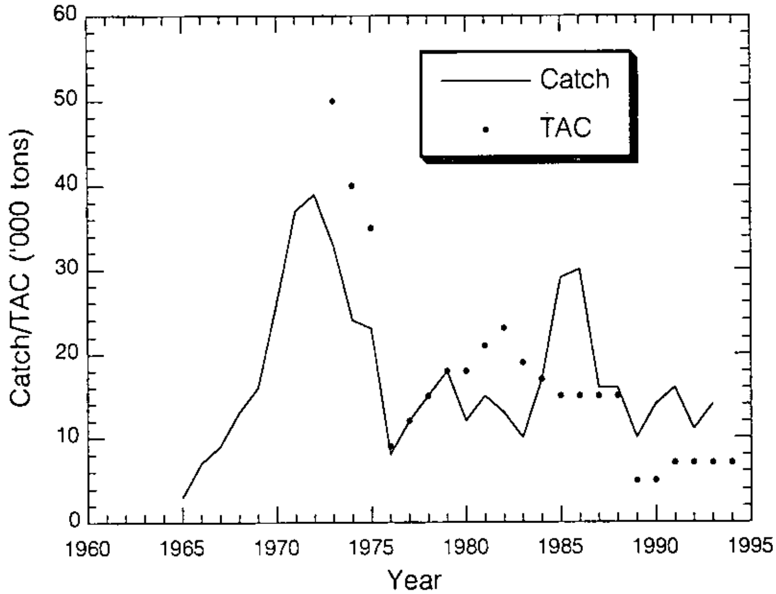


Fig. 24. Yellowtail flounder in Div. 3LNO: catches and TACs.

b) **Input Data**

i) **Commercial fishery data**

Catch rates. A multiplicative model was used to analyze the Canadian catch and effort data as in recent assessments. In 1991, the catch rate declined by 45%, to the lowest value in the time series, remained at about this level in 1992, then increased in 1993 (Fig. 25). The index in 1991 and 1992 was about one-third lower than the previous minimum value in the mid-1970s, and the 1993 point was still well below that level. The low values from 1991-93 were due in part to a switch in effort by the fleet to Div. 3O where a mixed fishery for American plaice and yellowtail flounder occurred. The CPUE in Div. 3N, where most of the stock was located, had not declined as sharply in recent years as the CPUE in Div. 3O. No series of catch-rate data were available from the fisheries in the Regulatory Area.

Catch-at-age and mean weights-at-age. Catch-at-age was calculated from length frequencies and otolith samples from the Canadian fishery in 1993. As was the case in 1992, no sampling data were available from any fisheries for yellowtail flounder in the Regulatory Area. It was not appropriate to apply the age composition from the Canadian fishery, to most otter-trawl catches in the Regulatory Area, because of differences in selectivity observed previously in these fisheries. Therefore it was not possible to calculate an age composition for about 50% of the catch in 1993, all of which was caught by non-Contracting Parties.

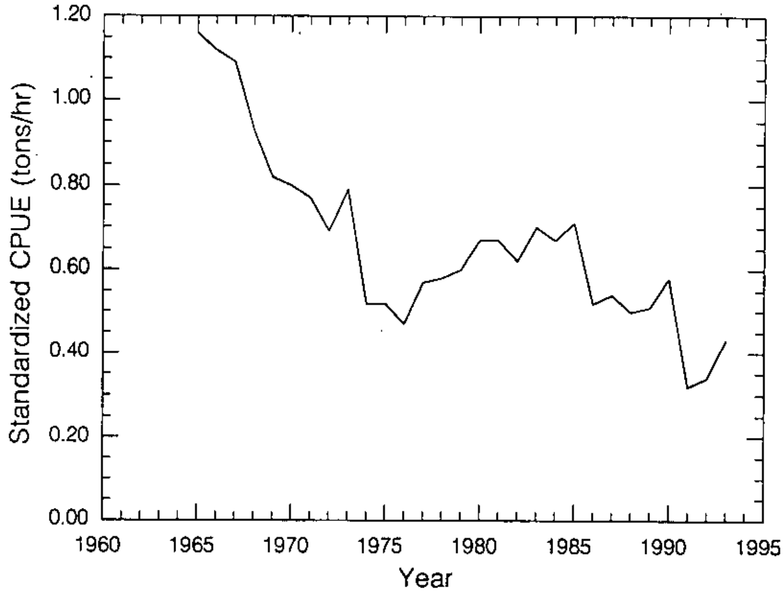


Fig. 25. Yellowtail flounder in Div. 3LNO: standardized catch rates.

In the Canadian landings, ages 6-8 dominated in 1992 consistent with other years. The mean weights-at-age from the Canadian catch were lower at ages 5 and 6 than in previous years, but were similar to earlier values at ages 7 to 9.

Given the continuing uncertainties with catch and the lack of sampling data from some fleets and years, no catch-at-age or mean weights-at-age have been calculated for the total removals for many of the years since 1984.

ii) **Research survey data**

Canadian stratified-random spring surveys (Fig. 26). Surveys have been carried out by Canadian research vessels in Div. 3LNO each year from 1971 to 1994 with the exception of 1983. The surveys from 1984 to 1994 were comparable in terms of coverage and vessel/gear used. Most of the trawlable biomass of this stock was found in Div. 3N, where the index declined from about 60 000 tons in 1985-86 to between 29 000 and 43 000 tons during 1988-94. In Div. 3L the trawlable biomass declined steadily from about 15 000 tons in 1984-85 to practically zero in 1992-94. In Div. 3O, the biomass index was relatively stable around 15 000 tons from 1988 to 1991, however, the 1992 and 1994 values were around 6 000-7 000 tons, compared to 27 000 tons in 1993. There was a high degree of variability associated with the 1993 estimate, and the 1992 and 1994 surveys suggest that this 1993 estimate may have been anomalously high.

The total abundance index of this stock was relatively stable, ranging between 240 and 340 million fish from 1975 to 1984, declined steadily until 1988, and has ranged from 85 million to 150 million in the 1988-93 surveys, with the lowest value in the time series occurring in 1992. The Canadian survey catches were usually dominated by yellowtail flounder aged 5-8 years. In 1993, the 1986 and 1987 year-classes, ages 7 and 6 years, respectively, comprised 65% of the total abundance. An analysis of total mortality rates (Z) from these surveys indicated Z values around 2 at ages 8 and 9, as had been noted in previous analyses. The current analysis also suggested increases in Z at ages 4 to 6 since 1985, although there was considerable variability in the estimates. STACFIS noted that the age-by-age information from the 1994 spring survey was not available at this meeting.

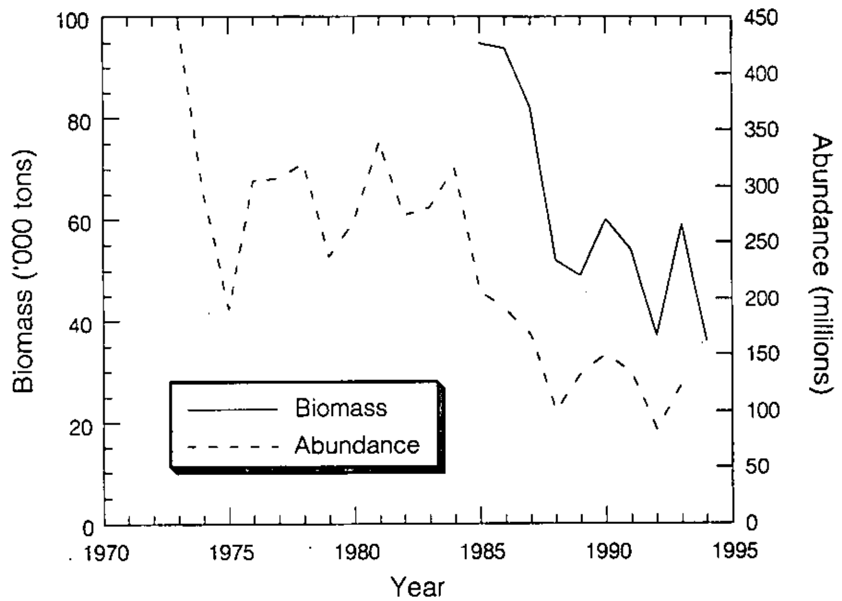


Fig. 26. Yellowtail flounder in Div. 3LNO: biomass and abundance estimates from Canadian spring surveys.

USSR/Russian groundfish surveys (1972-91). The trends in stock size in the USSR/Russian surveys were similar to those in Canadian surveys. However, there was no comparable survey in 1992 and data from the 1993 survey were not available at this meeting. STACFIS recognized the importance of the Russian survey data in providing an index of abundance for this stock and **recommended** that *the estimates from the 1993 and 1994 USSR/Russian groundfish surveys be presented in June 1995, if possible.*

Canadian stratified-random autumn surveys (1990-93) (Fig. 27). The trawlable biomass estimates from the autumn surveys in Div. 3LNO from 1990 to 1992 ranged from 38 000 to 48 000 tons, although the 1992 estimate was biased downward by the omission of one stratum and part of another which historically had relatively high yellowtail flounder abundance. The 1993 estimate of trawlable biomass was 67 000 tons, with all of the increase occurring in Div. 3N, unlike the increase in the spring 1993 survey, which was in Div. 3O.

Canadian juvenile groundfish surveys. From 1985 to 1993, annual stratified-random surveys have been conducted in Div. 3LNO, directed at juvenile American plaice and yellowtail flounder. In Div. 3L, the biomass declined steadily since 1985 to the lowest level in the series in 1993. The biomass estimate for Div. 3N which had shown a steady increase since 1988, and which declined in 1992, showed an increase in 1993. In Div. 3O, the 1993 biomass estimate remained at the same level as seen in 1992, both of which were 20% higher than in 1991.

In 1993 the total abundance-at-age showed a 25% increase from the 1992 estimate. This was due mainly to an increase in abundance of yellowtail flounder of ages 1 to 6 years. The abundance of ages 1-4 in 1993 increased by 14% but was the third lowest in the 8 year time series, while the abundance of age 7+ was the highest in the time series due mainly to the contribution of the 1986 cohort. The 1986 year-class, which was the second strongest in the time series at almost every age, next to the 1985 year-class, contributed 61% to the total estimate of age 7+ fish in 1993.

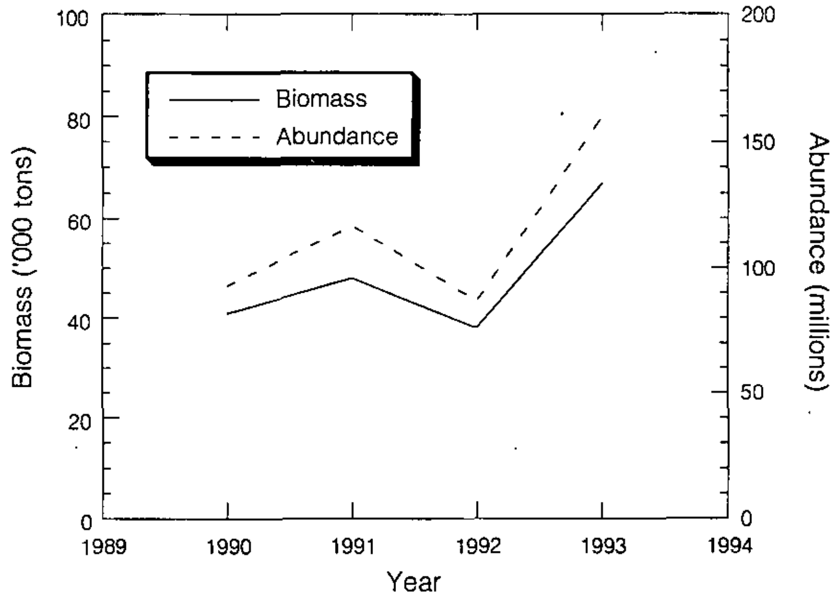


Fig. 27. Yellowtail flounder in Div. 3LNO: biomass and abundance from Canadian autumn surveys.

The 1992 year-class, at age 1, was the third lowest in the 8-year time series of age 1 abundance estimates, and well below the long-term average.

The 1991 year-class, at age 2, was the third highest in the time series, but only slightly above the long-term average.

The 1990 year-class, at age 3, was the fourth lowest in the time series, and well below the long-term average.

The 1989 year-class, at age 4, was the third highest in the time series, but was only slightly above the long-term average.

In the 1993 survey the majority of the 1988-92 year-classes, ages 1 to 5 years, were found in the Regulatory Area, which agrees with the usual pattern for juvenile yellowtail flounder in Div. 3NO.

In general, there was good agreement between the year-class estimates from the spring surveys and those from the juvenile surveys. However, STACFIS noted some caution is advised in interpreting these correlations due to the shortness of the time series of juvenile surveys.

Stock distribution. Three series of Canadian research vessel surveys of Div. 3LNO: spring groundfish surveys, 1971-94, autumn groundfish surveys, 1983-93, and late summer juvenile groundfish surveys, 1985-93, were examined in order to detect changes in distribution of yellowtail flounder. The decline in the northern range of concentrations occurred during a sustained cold period, 1983-93, on the Grand Bank, and at a time when the stock had been at or near its lowest level for a number of years. Contraction of the distribution from the northern part of the Bank to the area on and to the west of the Southeast Shoal may simply reflect movement of parts of the population from marginal habitats, but the cause is unknown at present. However, this contraction of the stock to a smaller geographical area makes it very vulnerable to over exploitation.

c) **Assessment Results**

Sequential population analysis (SPA) has been used in the past to assess this stock but had not been used since 1984 as the basis of advice. Since then, it has been concluded that the very high values of mortality at the older ages could not be fully explained and that the SPA models attempted were not appropriate. In 1990, the previously noted difficulties with the catch-at-age were raised, with the conclusion being that catch-at-age based models, such as SPA, were not suitable for this stock. Confidence in the catch and catch-at-age data for this stock remained at a low level, especially with the lack of sampling from fisheries in the Regulatory Area in both 1992 and 1993. Thus, evaluation of stock status continued to rely heavily on the interpretation of the available indices of abundance.

As in the recent assessments, there were 5 indices used to evaluate this stock (Canadian spring and autumn groundfish surveys, USSR/Russian groundfish surveys, Canadian juvenile flatfish surveys, and C/E from the Canadian commercial fleet) and most indicated that the stock was still at a low level compared to historic values. The decline in stock size in the mid- to late-1980s was caused by poor recruitment from the year-classes of the early-1980s and a rapid increase in catches to about 30 000 tons in 1985-86 from 10 000-15 000 tons in 1980-83. The year-classes of 1984-86 were stronger than their immediate predecessors and supported increased catches from 1989 to 1991. Available data suggested that there had likely been increased fishing mortality at ages 5 and younger in the late-1980s and early-1990s than in earlier years. Given the continuing inadequacies with the catch and sampling data, and still unresolved questions about the natural mortality-at-age for this stock, it remained impossible to estimate the level of fishing mortality in recent years.

d) **Prognosis**

The 1993 assessment concluded that the stock had remained at a low level, but that "a catch of 7 000 tons (current TAC) in 1994 should not be detrimental to the stock". It was then further reported that if total catches continue to exceed the TAC, the opportunity for this stock to rebuild to historic levels will likely not be achieved. Little has changed since this assessment. It should be noted that if the fisheries in the Regulatory Area continue at the 1993 level, with suspected high exploitation rates of juveniles, then this stock will likely remain low and perhaps decline further, particularly if predictions of reduced recruitment are accurate. Surveys prior to 1993 suggested that the 1987 and 1988 year-classes were average at best, although they were estimated to be somewhat higher in 1993. However, the juvenile surveys also indicated that the 1989 to 1992 year-classes may be average to well below average, and the 1994 spring survey showed a return of the biomass to the 1992 level.

It is important to note that even though most indices showed an increase in 1993, stock size was still well below that observed for most of the 1970s and early- to mid- 1980s, and that recent stability at this level should not be viewed as a sign that recent catch levels and exploitation patterns have been appropriate. There are also concerns, because the stock distribution has contracted to a relatively small area west of the Southeast Shoal, and since the bottom temperatures over most of the Bank have been below average for a number of years, that the stock at present is very vulnerable. It is also difficult to ignore the fact that many groundfish fisheries on the Grand Bank have either collapsed or been reduced to very low levels, which leads to the question as to how long yellowtail flounder will be able to maintain stability at its current low level.

The stock has remained at a low level for several years with catches around 10 000-16 000 tons (*versus* TACs of 5 000-7 000 tons) so further reductions in the total catch will be needed to allow some growth in stock size. Although there is an agreement that there will be no directed fishing on this stock in 1994, the actual reduction in catches will depend upon by-catch taken in other fisheries and catches by non-Contracting Parties. STACFIS **advised** that this stock should be rebuilt, and to rebuild this stock as fast as possible, no fishing should be permitted on yellowtail flounder in Div. 3LNO in 1995. A catch of 7 000 tons may allow some rebuilding, depending on the age composition of the catch and the strength of recruiting year-classes. Catches above the TAC level of 7 000 tons have not resulted in any growth in stock size in recent years. It should also be noted that continuing unregulated catches will hinder stock rebuilding, particularly if these catches consist mainly of juvenile yellowtail flounder.

13. **Greenland Halibut in Subareas 0 and 1** (SCR Doc. 94/9, 10, 17, 18, 31, 42, 47; SCS Doc. 94/3, 5, 10, 14, 15)

a) **Introduction**

The annual catches in Subareas 1 and 0 were around 9 000 tons in the period 1984-89 with more than 80% taken in Subarea 1, where most catches were taken inshore in the West Greenland fjords (Div. 1A). Before that time catches were low with Div. 0B contributing about 45% of the annual catches. In Subarea 1 a small offshore fishery for Greenland halibut began in 1987, mainly conducted by Japan and Norway. It has since then increased slowly to 4 300 tons in 1993. In Div. 0B catches increased considerably in 1990 due to development of a new trawl fishery.

Recent catches have been 26 627 tons in 1992 and 24 038 tons in 1993, with 62% taken in Subarea 1 (Fig. 28).

Recent TACs and catches ('000 tons) are as follows:

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Recommended TAC	-	25	25	25	25	25	25	25	25	25	25
Effective TAC	-	25	25	25	25	25	25	25	25	25	25
Div. 0B	+	1	+	+	1	1	15[1]	11[2]	11[2]	8[2]	
Div. 1BCDEF (offshore)	+	+	0	1	2	1	1	1[2]	3[2,3]	4[2]	
Div. 1A (inshore)	7	9	8	8	7	7	8	10[2]	12[2,3]	122[2]	
Total	7	10	9	10	10	10	24	22[2]	27[2,3]	24[2]	

[1] Catches under revision.
[2] Provisional.
[3] Including 1 457 tons non-reported.

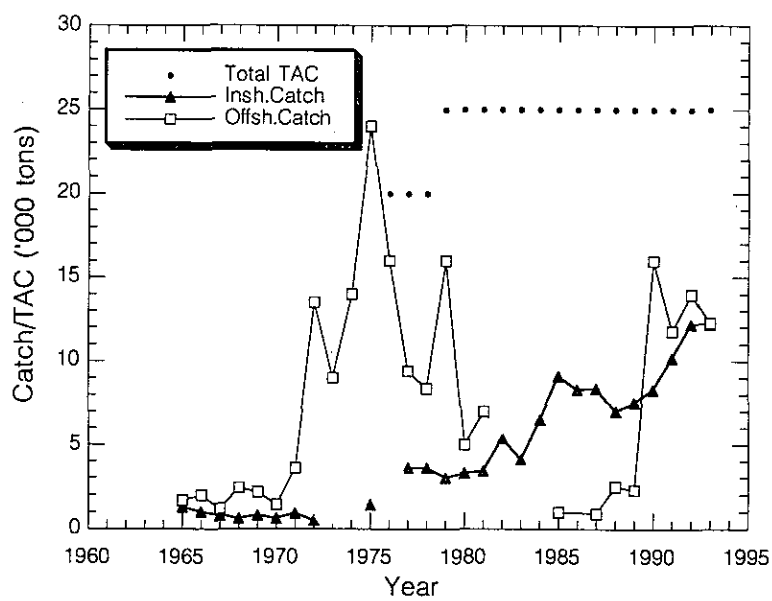


Fig. 28. Greenland halibut in Subareas 0 and 1: catches and TACs.

The fishery in Subarea 0. Prior to 1984, USSR and GDR conducted a trawl fishery in the offshore part of Div. 0B. Also Faroese longliners have regularly taken minor catches in this area. In 1990 and 1991 the Faroese longline catches were about 2 500 tons, but they dropped to a low level in 1992 and no catches were recorded from Faroe Islands in 1993. Since 1990 the trawl fisheries in Div. 0B have increased significantly. Catches in Div. 0B jumped from 907 tons in 1989 to about 14 500 tons in 1990 but decreased to 7 613 tons in 1993. The fishery in Div. 0B was restricted by the ice coverage and in 1993 most of the fishing took place during August-December.

No catches were reported from Div. 0A.

The offshore fisheries in Subarea 1. The offshore fishery in Subarea 1 (Div. 1C+1D) increased from about 900 tons in 1987 to 4 289 tons in 1993. Japanese trawl catches amounted to 1 434 tons in 1993. The Norwegian trawl fishery contributed with 1 775 tons and minor catches derived from the longline fishery by Faroe Islands (113 tons).

The inshore fisheries in Subarea 1. Most of the total catches in Subarea 1 were taken in the fjords of Subarea 1 by Greenland (74%), almost entirely in Div. 1A. Three areas comprise the fishery: Ilulissat (69°N), Ummannaq (71°N) and Upernavik (74°N) of which Ilulissat makes up about 40% of the catches. In Ilulissat and Ummannaq the fishery has been regulated due to concern on the stock status, and fishing effort is diverted to northern areas in Upernavik. Catches maintained a level of 12 200 tons from 1992 to 1993. The inshore Greenland fishery is carried out by gillnet and longline, either by boats below 20 GRT or by means of dog sledges, typically in the inner parts of the fjords at depths of 500-800 m. Since the mid-1980s gillnets became more common and in the period 1986-89 gillnets and longlines accounted equally for the catches in Div. 1A. Since then the annual proportion of catches from each gear has varied considerably, but in 1993 longline catches comprised about 76% of the total inshore catches, due to regulations in use of fishing gear. In recent years the inshore catches have been evenly distributed throughout the year.

b) Input Data

i) Commercial fishery data

Length frequency data were obtained both from a Norwegian factory trawler from offshore fishery in Div. 1CD, from catches taken deeper than 600 m by the Japanese vessel '*Shinkai Maru*' in Div. 1CD and from a trial fishery by a Norwegian longliner in Div. 1A.

For 1993 catch-at-age and weight-at-age data in Subarea 1 were available from the offshore fishery in Subarea 1. Catch-at-age data for Div. 0B from the period 1988-93 were this year provided by Canada. No maturity data were available.

From data collected by observers of the otter-trawl fisheries in Div. 0B 1988-93, standardized catch-rate series were calculated. From 1990 to 1991 standardized catch rates were fairly constant, but they declined significantly from 1991 to 1993. Catch rates for a Japanese trawler for the period 1987-92 showed a drop in 1991 but a 1992 value similar to the average of the years 1987-90. No catch rates were available for 1993 from the Japanese fleet. Average catch rates from the Norwegian trawl fishery in Div. 0B and 1CD and from Russian trawl fishery in Div. 0B were provided by the two nations for the period 1990-93. Catch rates in all Divisions decreased by about half during the period 1991-93.

Catch-at-age for the inshore areas in Subarea 1 were based on sampling from the commercial fishery with gillnets and longlines. Length samples were available for the entire period 1988-93, however, due to insufficient sampling from the fishery in 1991 and 1992, length samples for these years were pooled. Mean weight-at-age and the age-length data were pooled for the period 1986-88 and used to calculate catch-at-age for the period 1988-92. Catch-at-age for the period 1988-93 were rather stable, but the insufficient sampling make them difficult to interpret.

ii) **Research survey data**

Since 1987 bottom-trawl surveys have been conducted in Subarea 1 jointly by Japan and Greenland. In 1993 a survey was conducted in August/September. The survey covered Div. 1B to 1D at depths between 400 and 1 500 m. The trawlable biomass was estimated to be 37 700 tons, which was remarkably lower than in 1992 (62 000 tons) and 1991 (77 000 tons). Abundance estimates for Div. 1CD for the period 1988-92 fluctuated in the range 35-53 million but declined since 1991 to 30 million in 1993. Apart from ages 2 and 3, the decline was seen for all age groups from 1991 to 1993.

In the period 1990-92 the total biomass has shown a declining trend (see text table below). In the same period offshore catches were in the range 11 000-15 000 tons, compared to catches of about 2 000 tons or less in the period 1984-89.

Biomass estimates ('000 tons) from Greenland/Japanese surveys and German/USSR (GDR until 1989, EU-Federal Republic of Germany since 1990-91 and USSR until 1991, Russia since 1992) surveys for the years 1987-93 in Subareas 0 and 1 are as follows:

	USSR(RUS)/GDR(FRG) Surveys		Greenland/Japan Surveys		Total
Year	0B	1BCD	1BCD	1ABCD[1]	0B+1ABCD[2]
1987	37	56	54[3]	58[3]	95
1988	55	47	53	57	112
1989	79	-	63[4]	-	-
1990	72	88	53[5]	56[5]	128
1991	46	-	77	79	125
1992	38	-	62	64	102
1993	-	-	38	-	-

[1] Div. 1A south of 70°N.
[2] USSR(RUS)/GDR(FRG) Surveys Div. 0B + Greenland/Japan Surveys Div. 1ABCD.
[3] In 1987 the survey did not cover the depth stratum 1 000-1 500 m.
[4] Estimate only for Div. 1CD.
[5] Average values of two surveys.
\- no survey.

Since 1991 annual trawl surveys were conducted with a commercial shrimp trawler off West Greenland between 59°N and 72°30'N from the 3-mile limit to the 600 m depth contour line. Estimated trawlable biomass increased from 1991 to 1992 and remained stable until 1993, where it was estimated at 9 600 tons. The abundance index increased from 84 million in 1991 to 283 million in 1992 and remained stable to 1993 (239 million). The increase from 1991 to 1992 in biomass and abundance was supposedly due to a strong 1991 year-class. The same strong year-class appeared in the inshore area of Disko Bay in Div. 1A, which was surveyed in August/September. The biomass of Greenland halibut from this area was estimated at 2 100 tons, 4 000 tons and 2 400 tons for 1991 to 1993, respectively. Abundance estimates fell from 69 million in 1992 to 30 million in 1993.

A trial longline fishery was conducted offshore in Div. 1AB between 66°N and 73°N in August 1993 by a Norwegian vessel. The fishery was directed towards resources down to 1 400 m, depths which had never been investigated in these Divisions. Highest CPUE values of Greenland halibut was obtained at depths between 800-1 200 m. Mean length of Greenland halibut increased with depth. Length distributions of the catches ranged between 35 cm and 100 cm, with the majority being between 45 cm and 75 cm.

iii) **Biological studies**

Tagging experiments were carried out during 1986-92 in Greenland waters, inshore and offshore, in West and East Greenland. Recapture records indicated that Greenland halibut in the northwest Greenland fjords (Div. 1A) were stationary in these fjords and did not contribute to the spawning stock complex in the Davis Strait. Recapture records from offshore tagging in Div. 1CD suggested that the adult offshore component of Greenland halibut in Subareas 0, 1, 2 and 3 did intermingle to some extent. Recapture records west of Iceland from releases in the southwest Greenland fjords and East Greenland fjords indicated that the Greenland halibut components in these Greenland fjord areas did have a connection with the Icelandic spawning stock and possibly originated from that to some extent.

Investigations on sexual maturity of Greenland halibut inshore and offshore in Subarea 1, indicated that spawning in the offshore areas peaked in the first quarter of the year, although a significant proportion of the larger fish were not maturing. For the inshore areas, spawning seemed to occur sporadically and varied from one fjord to another, as well as between the years. Age compositions of the catch from the inshore fishery were very stable throughout the year, and this would also suggest that the inshore component in Div. 1A does not contribute to the spawning in the Davis Strait.

c) **The Biological Status of the Inshore Stock Component in Subarea 1**

With respect to a recommendation by STACFIS on the suballocation of a possible total TAC by geographical areas within Subareas 0, 1, 2 and 3 (NAFO Sci. Coun. Rep. 1993, p. 104), and to a 1994 request by Denmark (on behalf of Greenland) on the allocation of the TAC for Subarea 1 into inshore and offshore areas (see Agenda I, Annex 3 in Part E, this volume), the biological status of the inshore stock component in Subarea 1 was reviewed.

In its 1990 report (NAFO Sci. Coun. Rep., 1990, p. 87) the Scientific Council presented a review of the biological information on Greenland halibut in the Northwest Atlantic. Studies on stock delimitation in the area suggested that the Greenland halibut stock component in the fjords of West Greenland was mainly recruited from the spawning component in the Davis Strait area. However, it appeared that the fjord component (in Div. 1A) was not suggested to contribute to the spawning component in the Davis Strait area, as adult fish seemed to be very stationary in the fjords. The information presented at that time were not considered conclusive and the management status of the stock component was unchanged.

Since then other studies on the population dynamics of Greenland halibut have been carried out. Extensive tagging experiments have been newly reported. Migration of adult fish have never been recorded between the fjords and the offshore areas in West Greenland, despite the significant increase in offshore fishing effort, and although considerable numbers of Greenland halibut have been released both inshore and offshore. Recaptures of Greenland halibut released offshore have been reported from a trawl fishery developed offshore in Subareas 0 and 1. Studies on sexual maturity suggest that Greenland halibut in the fjords do only spawn there sporadically. As catch compositions are shown to be unchanged during the year it implies that the mature component is stationary.

Thus the recent information support the information provided by the Scientific Council in 1990, that the Greenland halibut stock component in the northern fjords of Subarea 1 is mainly recruited from the Davis Strait spawning component and that Greenland halibut after entering the fjords are stationary. There is very little fishery offshore in Div. 1A (less than 100 tons) and therefore tagging cannot conclusively test a possible link with Greenland halibut occurring inshore and offshore in Div. 1A. However, STACFIS **advised** that a separate assessment be carried out for the inshore areas of Div. 1A. There is ongoing research which will allow STACFIS to review its opinion after some years.

d) **Estimation of Parameters**

Mean estimates of Z-at-age based on abundance estimates from surveys of Greenland halibut in Div. 1CD in 1988-93, suggested an emigration of age groups 8-11 from the area surveyed. This suggestion is however based on assumptions on constant catchability, so an absolute level could not be estimated.

A sequential population analysis was attempted on the Greenland halibut offshore component in Subareas 0 and 1, but due to difficulties in the data set it was unsuccessful.

e) **Prognosis**

A combined prognosis for Greenland halibut in Subareas 0, 1, 2 and 3 is given in Section 15 below.

14. **Greenland Halibut in Subarea 2 and Divisions 3K and 3L** (SCR Doc. 94/22, 25, 29, 53, 57; SCS Doc. 94/13, 16)

a) **Introduction**

Catches increased from low levels in the early-1960s to over 36 000 tons in 1969, and ranged from 24 000 tons to 39 000 tons over the next 15 years . From 1986 to 1989, catches exceeded 20 000 tons only in 1987. In 1990, an extensive fishery developed in the deep water (down to at least 1 500 m) in the Regulatory Area, around the boundary of Div. 3L and 3M and by 1991 extended into Div. 3N where it has continued. The total catch estimated by STACFIS for 1990-93 was 47 000 tons in 1990, 55 000-75 000 tons in 1991 and about 63 000 tons in both 1992 and 1993. The major participants in the fishery in the Regulatory Area were EU-Spain and EU-Portugal, as well as some non-Contracting Parties such as Panama. STACFIS in its 1991-93 reports considered that catches from the Regulatory Area were from the Subarea 2 and Div. 3KL stock, and should therefore be included in the assessment of this resource.

Canadian catches peaked in 1980 at just over 31 000 tons, while the largest non-Canadian catches before 1990 occurred in 1969-70. USSR, Denmark (Faroe Islands), Poland and EU-Germany (GDR before 1989) have taken catches from this stock in most years, but catches by the latter two countries were negligible in 1991. USSR catches increased from about 1 100 tons in 1988-90 to 8 200 tons in 1991, the largest catch by this fleet since 1975. EU-Portugal and Japan have taken catches from this stock each year since 1984. Canadian catches have ranged from 8 200 and 13 500 tons from 1985-91. The Canadian catch declined in 1992 to 6 900 tons and further declined to 4 700 tons in 1993.

In most years, the majority of the catch has come from Div. 3K and 3L, with catches from Div. 2G and 2H usually being relatively low. Canadian gillnet catches were taken mainly in inshore areas, and except for 1992-93 had been around 7 000 to 10 000 tons in most recent years, down from a high of 28 000 tons in 1980. The gillnet catch in 1992-93 of 3 200 tons were the lowest since the fishery started in the 1960s. In 1991 and 1992 most of the gillnet effort had shifted from inshore to the deep slopes of the continental shelf in Div. 3K and northern Div. 3L at depths in excess of 800-1 000 m and by 1993 some of the effort had moved to the more northerly Div. 2G and 2H.

Canadian otter-trawl catches peaked at about 8 000 tons in 1982, declined to less than 1 000 tons in 1988 and increased to about 7 400 tons in 1990, which is the highest level since 1982. By 1992, the catch had declined again to a level of 2 800 tons and 1 500 tons in 1993.

Recent TACs and catches('000 tons) are as follows (Fig. 29):

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
TAC	55	75	100	100	100	50	50	50	50	
Catch	19	16	31	19	19	47[1]	55-75[1,2,3]	63[1,2]	62[1,2,3,4]	

[1] Includes estimates of misreported catches.
[2] Provisional.
[3] STACFIS could not reliably estimate total landings.
[4] Catch estimate may be as low as 42 000 tons.

b) **Input Data**

i) **Commercial fishery data**

Catch and effort. Catch and effort data from the directed fishery for the period 1975 to 1990 were obtained from ICNAF/NAFO Statistical Bulletins and were combined with provisional 1991-92 NAFO data and preliminary Canadian data for 1992-93. Data from the Spanish fishery in the Regulatory Area for 1992 were included in this analysis.

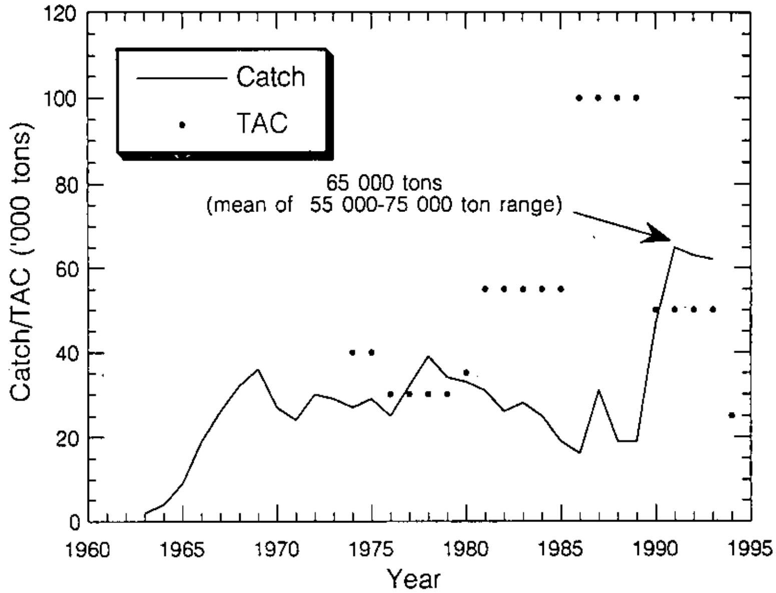


Fig. 29. Greenland halibut in Subarea 2 and Div. 3K and 3L: catches and TACs.

The catch/effort data were analyzed with a multiplicative model to derive a standardized catch-rate series for hours fished.

The standardized catch-rate series showed high within year variability, especially in the late-1970s to mid-1980s. There was an increasing trend from the mid-1970s to about 1981, then declined to the lowest observed by 1986. The standardized catch rate showed stability for the next several years but declined further to very low levels during 1991-93. There appeared to be little in the way of significant seasonal trends, however, it would seem that catch rates improved as the fishery moved progressively northward.

A preliminary analysis of unstandardized catch-rate data from the Spanish fishery for Greenland halibut in the Regulatory Area of Div. 3L, 3M and 3N from 1990-93 was also reviewed. This analysis also indicated a decline in catch rates in recent years but of a lesser magnitude than that of the analysis described above. It was difficult, however, to fully evaluate the significance of the decline in these data without a more thorough investigation.

Catch-at-age. Length sampling data from the catches of Canada, EU-Portugal, and EU-Spain were available at this meeting, however, mainly Canadian ageing data were used. Ages 6-8 dominated the catch in all years from 1988-91, which was typical of the Canadian catch in virtually all years. In 1992 and 1993, the catch-at-age for older ages increased because of the deepwater gillnet fishery at the continental slope of Div. 3K and northern Div. 3L as well as Div. 2G and 2H.

An examination of age frequency data from both EU-Spain and EU-Portugal indicated that most of the fishery in the Regulatory Area in 1992 was dominated by age 7 (35%) with 78% of the catch comprised of ages 6-8. Length frequency data in 1993 from Spanish freezer trawlers fishing to depths of 1 700 m for large vessels and 1 500 m for smaller vessels indicated that more than 90% of the catch was less than 60 cm. This suggested that very little of the catch was age 9 or older.

Data from the Portuguese otter-trawl fishery in Div. 3L indicated a decline in the mean and modal lengths in the catch from 1990 to 1991 and a further decline in 1992 and 1993. Few fish larger than 46 cm (about age 7) were sampled in the 1993 catches. In Div. 3N the size distribution in the Portuguese fishery indicated an increase in the mean lengths in the catch from 1992 to 1993 (males from 43.9 to 46.2 cm and females from 45.2 to 49.4 cm).

ii) **Research survey data**

Canadian stratified-random groundfish surveys in autumn. Biomass indices of Greenland halibut have been declining in Div. 2J (to depths of 1 000 m) since 1982 from a level of over 100 000 tons to less than 9 000 tons by 1992. There was a slight increase in 1993 to near that of 1991 but still the index was at a very low level. The biomass index in Div. 3K (to depths of 1 000 m) peaked at 112 000 tons in 1984 but by 1987 biomass in this Division also declined similar to Div. 2J and reached a low of just over 20 000 tons in 1992. In 1993 there was a similar proportional increase in biomass in Div. 3K as with Div. 2J to a level slightly higher than that of 1991. Estimates for Div. 3L to a depth of 366 m were relatively stable from 1981 to 1990 at about 15 000 tons. Between 1990 and 1991, the biomass index fell from nearly 17 000 tons to 7 300 tons and further to 6 700 tons in 1992 although complete survey coverage in 1991-92 was down to depths of 732 m. Unlike Div. 2J and Div. 3K, the biomass index for Div. 3L in 1993 continued to decline to a level of about half of the 1991-92 estimates. The cumulative biomass index for all three Divisions has rather steadily declined from a high of about 225 000 tons in 1984 to 37 000 tons in 1992 which is by far the lowest in the time series (Fig. 30). The cumulative estimate for 1993 increased from 1992 to 49 000 tons. STACFIS recognized that these estimates reflect biomass in the depths surveyed and that Greenland halibut are also found beyond these depths.

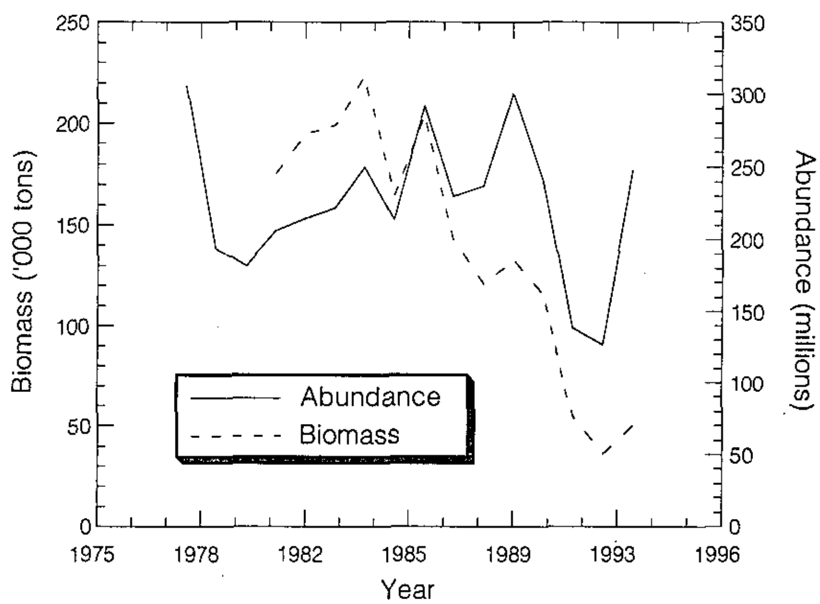


Fig. 30. Greenland halibut in Subarea 2 and Div. 3K and 3L: abundance and biomass estimates from Canadian surveys.

Since declines in biomass are not consistent across all age classes, decreases in age specific abundance are less apparent than in total biomass. An examination of the age structure indicated that the ages 6+ abundance had been declining since the mid-1980s and by 1993 the age 6+ abundance was far below anything ever observed, at a level of about one third of that estimated in 1992. Age 10+ had been declining since the early-1980s and by 1993 did not even appear incidently in the survey catches. On the other hand, ages 3-5 were slowly increasing from the early-1980s to about 1989. From 1989 to 1992, however, these age groups also declined very sharply to a level less than half the 1988 estimate. A sudden increase in abundance was observed in 1993 and was due to a significant increase in the estimated abundance of ages 2 and 3 in the 1993 survey.

Canadian deepwater surveys. The results of deepwater surveys conducted in the summer of 1991 (Fig. 31) and the winter of 1994 (Fig. 32) in Div. 3K, 3L and 3M (1991 and 1994) and Div. 3N (1994) were reviewed. Both surveys were conducted using 30 min. hauls with the same bottom trawls in a range of depths between 750-1 500 m. The results indicated a reduction in biomass; in Div. 3K from 32 000 tons in 1991 to 10 000 tons in 1994, in Div. 3L from 13 000 tons to 10 000 tons, and in Div. 3M from 24 000 tons to 10 000 tons. There was an overall reduction in biomass of about 60%, for all Divisions combined. STACFIS noted the results of these 2 surveys should be viewed with caution because they were conducted at different times of the year, by different ships, with different sampling designs. However, it should be noted that although there was a reduction in biomass, fish were distributed in a similar pattern in Div. 3KLM, in both years. The abundance at age 7+ was greater in all three Divisions in 1991, than in 1994, however, there was a considerably higher abundance of ages 3-5 in the 1994 survey than in the 1991 survey. There were very few fish older than age 9 observed in 1994. Biomass of age 9+ showed a reduction in all three Divisions, between 1991 and 1994. In 1991, age 9+ comprised 62% of the biomass in Div. 3K, 68% in Div. 3L and 70% in Div. 3M. In 1994, age 9+ fish comprised 34%, 14% and 31 % in Div. 3K, 3L and 3M, respectively.

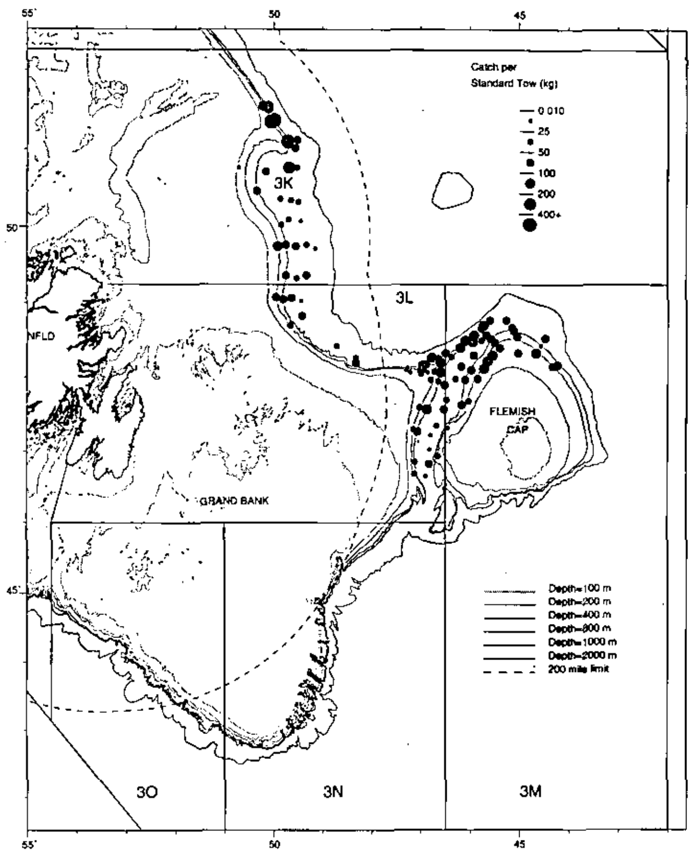


Fig. 31. Greenland halibut in Subarea 2 and Div. 3K and 3L: Canadian survey catches, summer 1991.

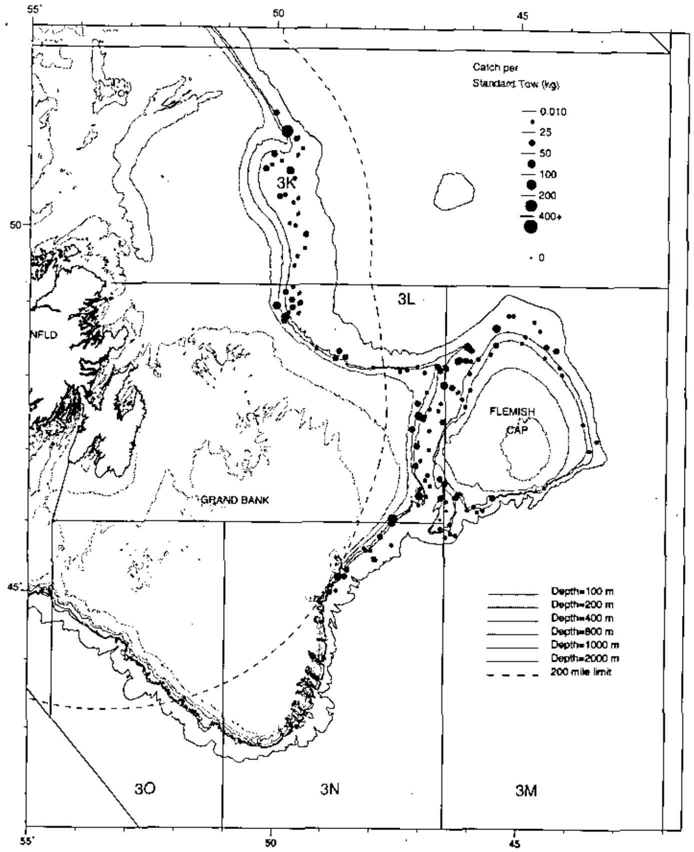


Fig. 32. Greenland halibut in Subarea 2 and Div. 3K and 3L: Canadian survey catches, winter 1994.

USSR/Russian stratified-random groundfish surveys. The results of the stratified-random survey conducted in Div. 2GH in 1992 (down to 1 500 m) showed that the abundance and biomass of Greenland halibut in this area were greatly reduced from levels observed in the early-1980s (down to 1 250 m). Since 1985, the biomass indices fluctuated around a very low level compared to the period of the early-1980s. No survey was conducted in this area in 1993. Some information on fishing sets in Flemish Pass to depths of 800 m during 1989-93 were provided and indicated that Greenland halibut comprised a very small part of the catch within these depth zones.

EU stratified-random surveys in Div. 3M. These surveys indicated that Greenland halibut biomass on Flemish Cap in depths to 730 m ranged from 4 300 tons in 1989 to 8 500 tons in 1992. The survey estimate in 1992 was similar to the value estimated in 1991 at 8 000 tons. The estimated biomass from this survey series in 1993 indicated a decline from 1992 to 7 200 tons. The estimates from these surveys were not indicative of the total biomass in Div. 3M and could only be interpreted as an index of the population in depths to 730 m. The age-composition data indicated that the abundance in 1992 was dominated by the ages 5-7 or the 1985-87 year-classes and that the 1993 survey was also dominated by the same year-classes in 1993 at ages 6-8. This survey did not show the same predominance of young fish as observed in the Canadian surveys.

iii) **Biological studies**

STACFIS examined length samples from the Canadian deepwater gillnet fishery in Div. 3K and northward to Div. 0B. It indicated that while there were mature fish in all samples, the size at 50% maturity increased from north to south suggesting a northward migration of maturing fish. There was evidence, nevertheless, of some spawning throughout the range. Studies conducted by EU-Spain in the Regulatory area also indicated that spawning takes place in this area as well. Both studies observed peculiarities in spawning stages and timing of spawning. The observations were consistent with the belief that Greenland halibut may not spawn annually. It was agreed that these types of studies are essential as the reproductive strategy of this species is very unclear but yet critically important in making appropriate decisions on harvesting strategy, and as such STACFIS **recommended** that *collection of maturity samples from deepwater fisheries on Greenland halibut be encouraged.*

c) **Estimation of Parameters**

STACFIS again noted that an analytical assessment of this stock was not possible. Although the available indices of abundance derived from surveys and CPUE series do not apply to the entire stock, STACFIS believed they can be used as indicators for evaluation of stock status.

d) **Prognosis**

A combined prognosis for Greenland halibut in Subareas 0, 1, 2 and 3 is given in Section 15 below.

15. **Greenland Halibut in Subareas 0, 1, 2 and 3**

a) **Prognosis**

Subareas 0 to 3

1. The Greenland halibut in Subareas 0-3 is considered a single stock as discussed in NAFO Sci. Coun. Rep., 1990. Fishing on one component affects the catch possibilities on other components and therefore all components of the Greenland halibut stock should be regulated. This applies particularly to the new fisheries in the Flemish Pass Div. 3LMN.

2. The yield taken of the Greenland halibut populations in recent years affects the populations significantly in all Subareas as is seen from declining catch rates and trawlable biomass. The same pattern is seen all throughout the offshore range.

3. There is concern about the impact of the present fishery on the stock, Greenland halibut being a deep water slow growing species is likely unable to sustain high exploitation levels.

4. The length of first maturity of Greenland halibut is around 60 cm and the trawl fisheries in all Subareas mainly catch fish below this size, hence the trawl fisheries exploit mainly immature Greenland halibut.

5. STACFIS maintains (Sci. Coun. Report, 1993, p. 104) that a single TAC for the entire stock area without consideration of effort distribution could lead to excessive effort being concentrated in different areas of distribution and this could lead to the collapse of important fisheries. STACFIS therefore **advised** that separate TACs be maintained for different areas of the distribution of Greenland halibut.

6. Because of uncertainty in evaluating the magnitude of declines in survey results and CPUE series STACFIS is not able to accurately calculate appropriate TAC levels. This applies to all Subareas. However, STACFIS considers that the offshore effort levels in all Subareas are in excess of what the Greenland halibut stocks can sustain and STACFIS **advised** that the effort and catches throughout Subareas 0 to 3 in 1995 should be reduced compared to recent years. This is further discussed below under the headings of the Subareas 0 and 1, and 2 and 3.

Subareas 0 and 1

7. There has been a significant amount of information collected which suggests that Greenland halibut in the northern West Greenland fiords (Div. 1A) do not contribute to the spawning stock in the offshore areas in Davis Strait. There is very little fishery offshore in Div. 1A (less than 100 tons) and therefore tagging cannot conclusively test a possible link with Greenland halibut occurring inshore and offshore in Div. 1A. STACFIS **advised** that a separate TAC be established for the inshore areas of Div. 1A. There is ongoing research which will allow STACFIS to review this position after a few years.

8. There is no information available suggesting that Greenland halibut in Cumberland Sound and coastal areas of Baffin Island are isolated from the occurrence offshore in Div. 0B. STACFIS **advised** that a TAC to be established combined for all of Div. 0B and Div. 1BCDEF.

9. Catch rates and survey trawlable biomass have decreased since 1991 and both the commercial and survey catch-at-age estimates showed a shift towards younger fish. Trawlable biomass estimates for Div. 1BCD decreased from 62 000 tons in 1992 to 38 000 tons in 1993. The decline was seen over the entire age range. This decline is much larger than the actual catch which occurred between these two surveys.

10. After 1989 the offshore fishery in Subareas 0 and 1 has expanded considerably. This increased exploitation is expected to cause a change in the stock composition in the area towards younger fish and with a lower total biomass. The decline both in the commercial catch rates and in the survey biomass are, however, marked and suggest a high exploitation level. STACFIS therefore **advised** that the TAC for 1995 be set below the offshore catch level of 11 000-15 000 tons seen in most recent years. This implies a TAC for 1995 for the total area of Div. 0B and Div. 1BCDEF combined be set below 11 000 tons. The catch inshore in Div. 1A is expected to be around 12 000 tons in 1995.

Subareas 2 and 3

11. The major fishing grounds at present in Subareas 2 and 3 are in Div. 3LMN in the NAFO Regulatory Area.

12. The survey in 1993 in Div. 2J and 3KL suggests that recruitment of ages 2 and 3 are above average. These fish will, however, under the present exploitation pattern not recruit to the fishery before they reach age 6-8. Recent surveys and the fishery indicate that the population in Div. 2J is at its lowest level on record. The 1993 survey also showed an absence of age 10+ fish compared with previous years. The winter deep water survey in Div. 3KLMN in 1994 compared with deep water survey in summer 1991 also showed a sharp decline of age 10+ fish.

13. STACFIS considers that the present fishery exploits this component well above sustained levels and that current effort levels must be reduced. Because of the decrease in catch rates, present catch levels are not likely to be maintained in 1995 unless more effort is introduced in these areas. A reduction in fishing effort requires TAC set well below present catch levels.

14. All available stock indicators (survey results and catch rates in the commercial fisheries) suggests a significant decline of abundance. STACFIS is unable to determine appropriate TAC levels since this partly depends on the uncertain state of the stock prior to the increased exploitation after 1989. STACFIS considers that any catch level above 40 000 tons for 1995 (*status quo* prediction including the catches by non-Contracting Parties) will not be adequate to restrict the fishery. Concern was expressed that based on some of the available stock indicators the catch in 1995 should be substantially lower to halt the decreasing biomass trend.

b) **Responses to Requests by Canada and Denmark (Greenland)**

Canada requested that *the Scientific Council provide an overall assessment of the total stock throughout its range and comment on its management.*

STACFIS is not able to provide an analytical assessment of the total stock but the available information indicates that the stock is overexploited; for further comments see the prognosis section for Greenland halibut above, particularly points 1, 2, 3, 5 and 6.

The two following recommendations are relevant in this context:

STACFIS **advised** that separate TACs be maintained for different areas of the distribution of Greenland halibut.

STACFIS **advised** that the effort and catches throughout Subareas 0-3 in 1995 should be reduced compared to recent years.

Denmark (on behalf of Greenland) requested that the Scientific Council *report on:*

a) *analysis of the existing information on stock delimitation in Subareas 0, 1, 2 and 3,*
b) *allocation of TACs to appropriate Subareas (within Subareas 0 and 1), and*
c) *allocation of the TAC for Subarea 1 into inshore and offshore areas.*

Concerning a), see points 1, 2, 7 and 8 in the prognosis section on Greenland halibut above.

Concerning b), STACFIS updated the available information which may be used in an allocation of the TAC between Subareas 0 and 1. This update confirmed the STACFIS comments of 1993 (NAFO Sci. Coun., 1993, p. 104):

"Catch and effort information by month and Divisions were available but these were not necessarily indicative of the stock distribution."

"Based on survey information from Subareas 0 and 1 in 1987, 1988 and 1990 the offshore biomass was distributed approximately 50:50 between these two Subareas". The biomass results are as follows:

Biomass estimates ('000 tons) from Greenland/Japanese surveys and USSR(RUS)/GDR(FRG) surveys for the years 1987-93 in Subareas 0 and 1.

	USSR(RUS)/GDR(FRG) Surveys		Greenland/Japan Surveys		Total
Year	0B	1BCD	1ABCD[1]	1BCD	0B+1ABCD
1987	37	56	58[2]	54[2]	95
1988	55	47	57	53	112
1989	79	-	-	63[3]	-
1990	72	88	56[4]	53[4]	128
1991	46	-	79	77	125
1992	38	-	64	62	102
1993	-	-	-	38	-

[1] Div. 1A south of 70°N.
[2] In 1987 the survey did not cover the depth stratum 1 000-1 500 m.
[3] Estimate only for Div. 1CD.
[4] Average values of two surveys.
- no survey.

Concerning c), STACFIS stated in 1993 that "No estimate on the inshore biomass in Subarea 1 was available to STACFIS,..".

Also in 1994 no inshore biomass estimates were provided for this component. STACFIS is therefore unable to provide an answer. However, see points 7, 8 and 10 in the prognosis section for Greenland halibut above.

16. **Roundnose Grenadier in Subareas 0 and 1** (SCR Doc. 94/31; SCS Doc. 94/15)

a) Introduction

A total catch of 98 tons has been reported to date for 1993 compared to 107 tons for 1992.

Recent catches and TACs ('000 tons) are as follows (Fig. 33):

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
TAC	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Catch	0.1	0.1	0.4	0.5	0.08	0.24	0.19[1]	0.11[1]	0.1[1]	

[1] Provisional.

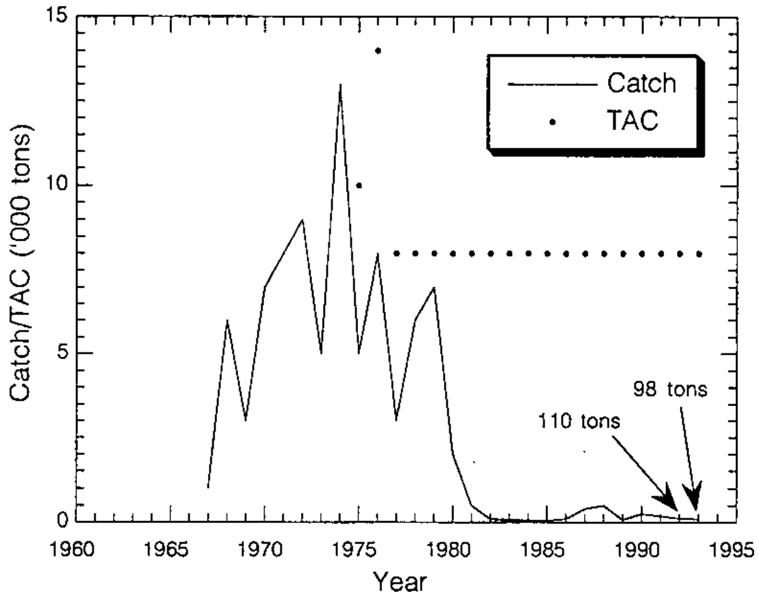


Fig. 33. Roundnose grenadier in Subareas 0 and 1: catches and TACs.

b) **Input Data**

i) **Commercial fishery data**

There has been no directed fishery for roundnose grenadier in Subareas 0 and 1 since 1978. Present catches are by-catch in the fishery for Greenland halibut. No update was possible of the catch effort analysis presented in NAFO Sci. Coun. Rep., 1985, p. 72.

ii) **Research survey data**

Since 1987 Japan in cooperation with Greenland has conducted bottom trawl research surveys in Subarea 1. The trawlable biomass in Div. 1CD for the depth range 400-1 500 m were estimated as follows:

Year	1987	1988	1989	1990	1991	1992	1993
Biomass	45 800[1]	44 000[2]	5 900[3]	20 300[4]	41 700[4]	40 200[4]	8 200[4]

[1] June/July depth 400-1 000 m.
[2] September/October.
[3] April/May.
[4] August/September.

The 1993 estimate is the lowest recorded in the August/September surveys. As usual, only a few roundnose grenadier were taken at depths less than 600 m. Eighty-five percent (85%) of the biomass was found in Div. 1D below 1 000 m.

c) **Prognosis**

The surveys do not cover the entire stock area as roundnose grenadier occur deeper than 1 500 m and also in Subarea 0. Hence the trawlable biomass is an underestimate. The surveys, being the only stock indicator available, suggest that the stock is declining even though the commercial catches are very small. Since 1977, a value of 8 000 tons has been used as a precautionary TAC but STACFIS is not able to evaluate whether this value is appropriate under present conditions.

17. **Roundnose Grenadier in Subareas 2 and 3** (with some comments on Roughhead Grenadier) (SCR Doc. 94/23, 29, 48; SCS Doc. 94/3, 13)

a) **Introduction**

Prior to 1979, catches averaged about 26 000, tons but since then have only averaged about 4 500 tons. Previously, the Scientific Council had commented on the possible misidentification of the species actually caught, with roughhead grenadier being reported as roundnose grenadier. Information was made available this year to quantify this misidentification. Based on this information, catch estimates were revised downwards based on detailed examination of catches in the Regulatory Area by EU-Spain and EU-Portugal.

Nominal catches, revised catches, and TACs ('000 tons) for roundnose grenadier in the recent period are as follows (Fig. 34):

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
TAC	11	11	11	11	11	11	11	11	11	11	3[1]
Catch[2]	4	5	7	7	5	5	1	5-10[3,4]	3[3]	4[3]	
Catch[5]	4	5	7	8	6	5	4	9-14[3,4]	8[3]	11[3]	

[1] Inside Canadian zone only.
[2] Includes adjustments reported in SCS Doc. 94/13 and SCR Doc. 94/29.
[3] Provisional.
[4] Includes estimates of misreported catches which could not be determined precisely.
[5] Original values reported to NAFO.

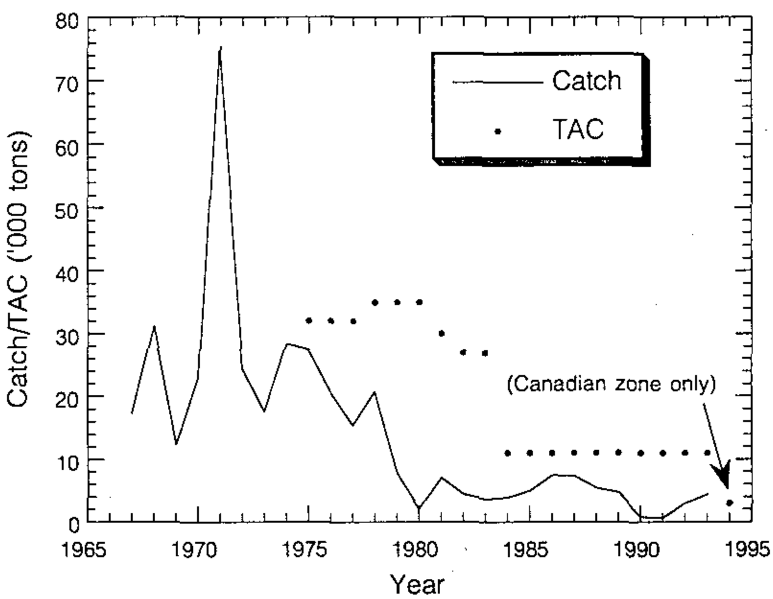


Fig. 34. Roundnose grenadier in Subareas 2 and 3: catches and TACs.

The provisional 1993 catch was 4 408 tons, up from about 3 000 tons in 1992. Revised estimates suggest that the catches may have been less than 1 000 tons in 1990 and 1991, although some estimates placed the 1991 catch as high as 10 000 tons. There has been no fishing effort by the EU-Germany/GDR or USSR/Russian Federation since 1990. Their fisheries traditionally took place in the Canadian zone, primarily in Div. 3K. In 1993 there were no allocations to non-Canadian vessels. Prior to the increase in fishing effort in the Regulatory Area in the early-1990s directed for Greenland halibut, the traditional fishery took place primarily during the second half of the year when the fish moved up the slope into shallower water. Because revised estimates of catches in the Regulatory Area by EU-Spain and EU-Portugal were only recently available, it was not possible to determine the pattern of catches by area and season.

Canadian industry has not shown any significant interest in pursuing this fishery.

Based on revised calculations, catches of roughhead grenadier in the Regulatory Area ('000 tons) have been estimated to be as follows:

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Catch	0	0	3	1	1	+	3	4[1]	5[1]	6[1]

[1] Provisional.

b) **Input Data**

i) **Commercial fishery data**

Because there was no fishery in the 'traditional' area inside the Canadian zone in 1993, there were no new commercial catch or effort data available for examination. As was the case in 1993, similar data for the by-catch fisheries in the Regulatory Area were not available.

ii) **Research survey data**

Information on catch distribution from 1993 Canadian autumn stratified-random trawl survey was presented. Similar to results from previous years, the highest catches were taken in Div. 3K at about 51°N, an area corresponding to the location of most of the commercial effort in earlier years. It was recognised that since the surveys only cover depths to 1 000 m, the information they provide is limited because the distribution of roundnose grenadier extends deeper than this. This was confirmed through examination of results from deepwater (750-1 500 m) surveys conducted by Canada in 1991 and 1994 which, while showing the largest concentrations to be at about 51°N in Div. 3K, also indicated that the best catches were taken between 1 000 and 1 500 m.

Based on the results from these surveys, concentrations in the Sackville Spur area of Div. 3L, across the north of Flemish Cap, and in the Flemish Pass were not as great as those in Div. 3K. Estimates of trawlable biomass from these two surveys indicated no change in Div. 3K, but declines in both 3L and 3M from 1991 to 1994. Based on the 1994 survey results, the biomass was lowest in Div. 3N of all surveyed Divisions.

Estimates of biomass for roughhead grenadier were lower than for roundnose grenadier in Div. 3K, but higher in Div. 3L, and about the same as roundnose grenadier in Div. 3M. The increased estimates for Div. 3L and 3M in 1994 were probably the result of increased survey area. There were no very large concentrations of roughhead grenadier found, although the 1994 results suggested somewhat higher biomass of roughhead grenadier in southern Div. 3L and 3N. The biomass in Div. 3N in 1994 was the lowest of the 3 Divisions, but was about 6 times higher than the estimate for roundnose grenadier. This ratio of the two species corresponded closely with the ratio of the two species reported in catches in this area by both EU-Spain and EU-Portugal.

c) **Prognosis**

In 1991, STACFIS concluded (NAFO Sci. Coun. Rep., 1992, page 127) that there are insufficient data upon which to base an assessment of roundnose grenadier. This situation has not changed because Canadian industry has not pursued this resource, and there has been a gradual decline in allocations to non-Canadian fleets inside the zone, culminating in a complete elimination of these allocations in 1993. Deepwater surveys in Div. 3K in 1991 and 1994 suggest no change in status in Div. 3K during this time period. The current TAC for all of Subareas 2 and 3 inside the Canadian zone (3 000 tons) is about 15% of the estimated biomass for Div. 3K, where the traditional fishery was primarily prosecuted, and does not appear to be excessive.

The estimated biomass of roundnose grenadier in Div. 3LM was slightly less than that in Div. 3K in 1991, and declined to only about 50% of the estimate for Div. 3K in 1994. The average annual catch based on revised breakdowns of the species for 1991-93 was only about 2 200 tons. This represents about 25% of the estimated biomass in 1994, but it is probable that there was substantial discarding. Although exploitation cannot be quantified, it has been greater in the Regulatory Area compared to the 'traditional' area in recent years. It is not possible to determine the effects of this, but catches have increased significantly between 1991 and 1993 in the Regulatory Area. STACFIS noted that the effort exerted on Greenland halibut in this region in recent years has been extensive, and the relatively low by-catch of roundnose grenadier may indicate a limited resource in the area.

There have been previous concerns about possible species misallocation of grenadier catches in the developing fishery in the Regulatory Area (roughhead grenadier being reported as roundnose grenadier). Information presented this year indicated that these concerns were well founded. STACFIS was pleased that this information was provided this year by both EU-Spain and EU-Portugal, and encourages all Contracting Parties with similar information to make them available in the future.

18. **Capelin in Divisions 3N and 3O** (SCR Doc. 94/14, 22; SCS Doc. 94/1)

a) **Introduction**

Nominal catches in the Divisions increased from about 750 tons in 1971 to 132 000 tons in 1975 and declined to 5 000 tons in 1978. During this period, most of the catch was taken by USSR trawlers and Norwegian purse seiners. The fishery was closed during 1979-86, was opened under quota regulation during 1987-92, and closed in 1993.

Recent catches and TACs ('000 tons) are as follows (Fig. 35):

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Advised TAC	0	0	0	10	10	28	30	30	30	0	0
TAC	0	0	0	10	15	28	30	30	30	0	0
Catch	0	0	0	1	7	9	25	+[1]	+[1]	0[1]	

[1] Provisional.

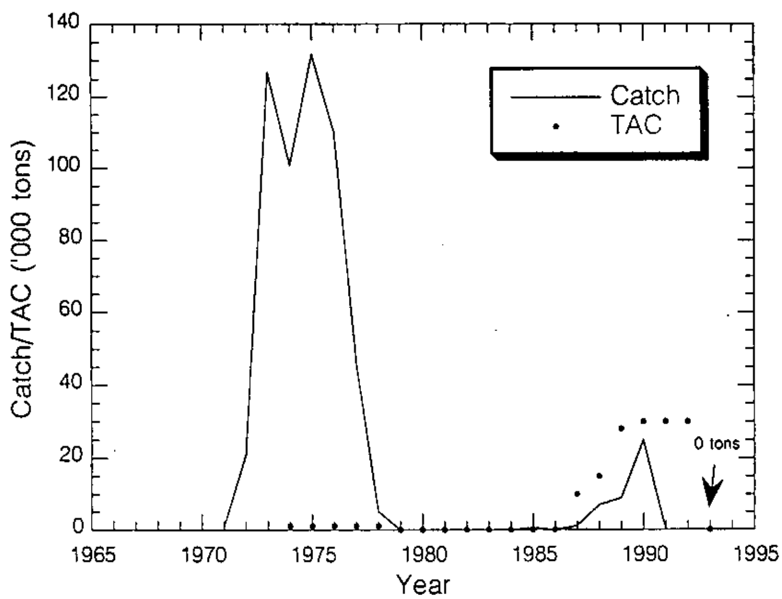


Fig. 35. Capelin in Div. 3N and 3O: catches and TACs.

b) Input Data

i) Research survey data

USSR acoustic surveys during 1975-77 indicated a mean biomass of 900 000 tons. Based on USSR and Canadian acoustic surveys, the mean biomass from 1981-88 was about 300 000 tons. These historical biomass estimates ('000 tons) for capelin in Div. 3NO are as follows:

	1975	1976	1977	1978	1979	1980	1981	1982	1983
USSR	1 050	687	1 000				109		269
Canadian							223	419	219

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
USSR*			559	315						191
Canadian	88	212	495	230	560	28			4	

* Russia after 1991.

Due to stocks mixing prior to spawning, STACFIS was unable to quantify what portion of the 991 000 tons estimated from the USSR acoustic survey in May 1990 in Div. 3O would spawn in Div. 3L and in Div. 3NO. An USSR acoustic survey conducted in June 1991 in Div. 3N did not detect capelin and a Canadian acoustic survey in June 1992 resulted in a biomass estimate of 4 000 tons.

STACFIS concluded that both the 1991 and 1992 surveys had been conducted prior to the arrival of capelin on the spawning grounds.

A Russian acoustic survey conducted during June 1993 in Div. 3LNO resulted in a biomass estimate of 315 000 tons. Of this total biomass estimate, 191 000 tons occurred in Div. 3NO and of this Div. 3NO total, 130 000 tons were mature. Capelin of the 1990 year-class accounted for 73% of the catches by numbers over the entire survey area. Capelin of the 1992 year-class were observed in large numbers during the acoustic survey but their biomass could not be quantified because of the lack of reliable target strength estimates.

ii) Capelin in adjacent areas

During the Russian acoustic survey in June 1993, 126 000 tons of capelin were estimated in Div. 3L, compared to a 1991 estimate of 118 000 tons. Capelin of the 1990 year-class dominated (82%) during the 1993 survey.

Capelin were reported as by-catch during Spanish groundfish surveys in Div. 3M during 1992 and 1993 but had not been caught during similar surveys during 1988-91. Based on historical records, capelin are considered a rare species in Div. 3M.

b) Prognosis

Based on historical patterns, ages 3 and 4 (1992 and 1991 year-classes) would be expected to dominate in the spawning stock in Div. 3NO during 1995. Although STACFIS was encouraged by the qualitative observations that the 1992 year-class was abundant, no estimates were available and consequently, no projections could be made. STACFIS noted that the 1993 acoustic estimate is the highest since 1988 and is about 43% of the 1981-89 and 14% of the 1975-77 average biomass. STACFIS reiterated its previous concerns regarding relatively low biomass levels in the Div. 3NO stock because of the implications for future recruitment and because of the importance of capelin as a forage species. A Russian survey is planned for June 1994, and if the results of this survey are available during the September 1994 meeting, STACFIS would re-evaluate the status of the stock at that time. If the stock is not re-evaluated at that time, STACFIS **advised** that no capelin fishing be allowed in Div. 3NO during 1995.

19. **Squid in Subareas 3 and 4** (*SCR Doc. 94/37, SCS Doc. 94/1, 94/12*)

a) Introduction

Catches of squid (*Illex illecebrosus*) in Subareas 3 and 4 started showing an upward trend in 1989 with a total of 7 000 tons and an additional 6 800 tons in Subareas 5 and 6. In Subareas 3 and 4, catches increased to 11 000 tons in 1990 and subsequently declined to 3 000 tons in 1993 while in Subareas 5 and 6 catches increased to 18 000 tons in 1993. A catch of 300 tons in Subarea 3 during 1993 was directed to squid, and the remainder of the catch occurred as directed catch and by-catch in the Subarea 4 silver hake fishery.

Recent TACs and catches ('000 tons) are as follows (Fig. 36):

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
TAC	150	150	150	150	150	150	150	150	150	150
Catch	1	+	2	1	7	11	4[1]	2[1]	3[1]	

[1] Provisional.

In comparison, the following statistics ('000 tons) were recorded in Subareas 5 and 6 for the last 5 years:

	1989	1990	1991	1992	1993
Catches	7	12	12[1]	18[1]	18[1]

[1] Provisional.

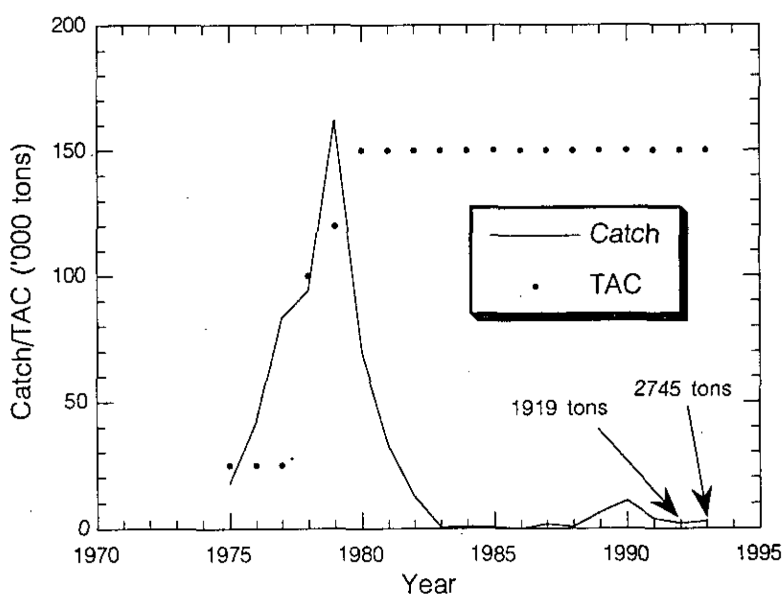


Fig. 36. Squid in Subareas 3 and 4: catches and TACs.

b) **Input Data**

i) **Commercial fishery data**

In the Cuban silver hake fishery, March-August 1993, squid by-catches were not recorded until the middle of June. The overall catch rate was 0.1 tons of squid per hour or 0.3 tons per tow. The squid by-catch was about 10% of the silver hake catch.

ii) **Research survey data**

Squid sampled in Div. 3P during October 1993 were larger and males in more advanced stages of sexual maturation than those sampled later in Div. 3L. This may be related to warmer water conditions or different feeding regimes.

The eleven year low (1983-93) of squid abundance in Subarea 3 is the longest period of low abundance on record. Previous periods of low squid abundance have usually coincided with cold water temperatures.

Survey abundance indices in Subareas 5 and 6 indicate that the squid stock is at a medium biomass level.

c) **Estimation of Parameters**

There were no data available on which to base an assessment.

The most important characteristic of this stock is that there is only a single age group present at any time. Although the relationship between spawning biomass and recruitment is believed to be most important for current management, this relationship is poorly known. The basis for management was discussed extensively by ICNAF and was changed after 1973, when it was concluded that fishing levels were having no harmful effect on subsequent recruitment. In 1979, from a theoretical point of view, effort regulation was considered to allow more effective management, but some practical difficulties hampered its enforcement. In 1980, it was concluded that a TAC of 150 000 tons for Subareas 3 and 4 in conjunction with effort constraints remained the most satisfactory means of preventing over-exploitation in years of moderate or high abundance. In years of low abundance the fishery would be self-regulated.

d) **Prognosis**

There was a small-scale directed fishery for squid in 1989-91 but since then most of the catch has been by-catch in the silver hake fishery. Without up-to-date information on the squid stock, especially for recruitment, STACFIS is not able to provide updated advice and this situation will remain as long as there is no research effort.

20. **Other Finfishes Subarea 1** (SCR Doc. 94/7, 10, 31; SCS Doc. 94/11, 14, 15)

a) **Introduction**

Catches of American plaice, wolffishes, starry skate and Greenland cod in Subarea 1 are taken by offshore trawl fisheries directed to shrimp, cod, redfish and Greenland halibut, by longliners operating both inshore and offshore and by pound net and gillnet fisheries in inshore areas only. The statistics of these by-catches seem to be poorly reported in general. In 1993, catches of these species amount to 2 500 tons representing 12% of the total finfish catch reported. Landings of Greenland cod (1 892 tons) dominated the catch of other finfishes by 75%.

b) **Input Data**

i) **Research survey and trial fishery data**

EU-Germany groundfish survey. Annual abundance and biomass indices were derived from stratified-random bottom trawl surveys which commenced in 1982. These surveys covered the areas from the 3-mile limit to the 400 m isobath of Div. 1B to 1F, and were primarily designed for cod as target species. During the periods 1982-84 and 1988-93, pronounced negative trends in aggregate fish abundance and biomass were observed. Since 1988, overall decrease in aggregate abundance and biomass amounted to 88% and 99%, respectively. The fish species Atlantic cod, American plaice, golden and beaked redfish, Atlantic and spotted wolffish and starry skate contributed to the dramatic decline in total fish abundance and biomass. Length distributions revealed that at present very small individuals dominate demersal stocks in this area. A production model based on a multiple regression explains 87% of the observed variability in annual aggregate fish production with cod recruitment and fishing effort as explanatory factors. On the basis of low fishing effort and poor recruitment, the model prognosticates stagnant fish biomass at lowest level for 1994.

Greenland-Japan groundfish survey. Since 1987, cooperative trawl surveys directed to Greenland halibut and roundnose grenadier have been conducted on the continental slope in Div. 1A to 1D at depths between 400 m and 1 500 m. In August and September 1993, biomass indices of these species amounted to 5% of the total finfish biomass, which was dominated by Greenland halibut (76%) and grenadiers (20%). In comparison to the results of a similar survey in 1992, the estimated biomass indices of almost all the species decreased.

Greenland and Norway trial longline fishery. In August 1993, a trial longline fishery for Greenland halibut was conducted in the northern Davis Strait (Div. 1A and 1B). During 13 fishing days, 154 328 hooks in 44 longline settings at depth ranging from 400-1 400 m were hauled. A total of 16 465 fish were caught. The by-catch of other finfish in numbers amounted to 37% and was dominated by Arctic skates (95%) while other species rarely occurred.

c) **Prognosis**

Based on information derived from survey data STACFIS considered that American plaice, wolffishes and starry skate off West Greenland are at a very low level, and any catches of these species will reduce the probability of recovery.

V. RESPONSES TO FISHERIES COMMISSION REQUESTS

STACFIS considered the request from the Fisheries Commission with regards to cod in Div. 2J, 3K and 3L, and the report was submitted to the Scientific Council for review and adoption (see Section II.6 of the Council report).

Mesh size in the redfish fishery in Div. 3LN, minimum fish size and minimum sizes of products corresponding to minimum landing sizes were dealt with by the Scientific Council (see Section II.6 of the Council report).

VI. AGEING TECHNIQUES AND VALIDATION STUDIES

1. **Report on Methods of Ageing Silver Hake Otoliths**

In 1992 a decision was made by Canada to move the silver hake age reading work from the St. Andrews Biological Station, New Brunswick, to the Bedford Institute of Oceanography, Nova Scotia. Training of the new age reader was completed in July 1993. The overall agreement between old and new readers was in excess of 70% and while there was an indication of bias in one of the two comparisons, there was only a small difference in estimated catch-at-age. Using glycerin-stored otoliths appeared to reduce age reader subjectivity and the need to minimize time between collection, and the transfer to glycerin was recognized as an important factor in the process. Estimated ages for 1993 were therefore considered to be based on criteria consistent with those used in the past and precision of ages of the new reader were similar to those for historical samples.

In response to the 1991 and 1992 recommendation of the Scientific Council regarding publication of a comprehensive manual on silver hake ageing, STACFIS was informed that the work on the silver hake radio-nucleotide study was unsuccessful because of technical reasons. Consequently, the status of the initially proposed report on ageing techniques must now be reviewed in light of the lack of results from this study, as well as the change in responsibilities for the Canadian research group conducting ageing studies. The results of this review will be reported to STACFIS at its September 1994 Meeting.

2. Reports on the Otolith Exchanges of American Plaice and Greenland Halibut

STACFIS noted that the exchange of otoliths of American plaice from various areas in the Northwest Atlantic had been completed some time ago and the results had not yet been tabulated. It was agreed these should be presented to STACFIS no later than June, 1995.

The exchange of otoliths and scales from Greenland halibut from different areas in the Northwest Atlantic had not been completed. STACFIS agreed it will be necessary to determine the status of the exchange and to ensure its completion, and then to tabulate and present results from this exchange to STACFIS as soon as possible.

3. Other Ageing and Validation Studies

There were no reports of other ageing and validation studies presented at this meeting.

VII. GEAR AND SELECTIVITY STUDIES

1. Reports on Gear and Selectivity Studies

Investigations on reducing the discard of small shrimp and juvenile fish in the shrimp fishery have been ongoing since 1991 jointly by Greenland, Iceland, Faroe Islands, Norway, Sweden and Denmark. In 1993 a grid device was tested in a commercial shrimp trawl. So far, the device is not adoptable for the fishery due to loss of large shrimps. Additionally, selectivity parameters of a commercial shrimp trawl from Greenland were estimated based on alternate hauls with different cod-end mesh sizes. A report on this investigation is expected next year.

2. Proposals for Gear and Selectivity Studies

STACFIS noted that the gear and selectivity studies on prevention of catches of small redfish in the shrimp fisheries in Subarea 1 were ongoing and encouraged the continuation of this work.

VIII. RELATIONSHIPS BETWEEN ACOUSTIC BIOMASS ESTIMATES AND OTHER METHODS

Considering management measures recently adopted by the Fisheries Commission and Coastal States, i.e. closing of fisheries, STACFIS faces the situation that no fishery based data will be available in future for a lot of stocks. Consequently, analytical assessment cannot be conducted in those cases. Stock assessments then will be based mostly on fishery independent data like surveys. In this context the importance of acoustic survey data will be increased. However, the problem of comparability of results based on acoustic surveys and results based on surveys using trawl or longline, etc., has not been resolved yet. Therefore, STACFIS encourages that research be undertaken.

Concerning surveys combining estimates from trawl fishery and estimation from acoustic measurements, STACFIS **recommended** that:

1. *Information be provided to compare size distributions from the trawl component and the pelagic component at the same stations, and more detailed information be presented describing the vertical and horizontal distribution as determined from the trawl-acoustic surveys, and*

2. *further examination be conducted of trawl acoustic survey data to provide more details on the location or concentration of fish species, both near the bottom and in the water column, in all areas in which combined trawl acoustic surveys are carried out.*

IX. OTHER MATTERS

1. **Progress Report on the Special Session in 1994**

STACFIS was informed that due to many other symposia scheduled around September 1994, including the ICES Statutory meeting in Newfoundland, only a limited number of papers had been submitted for the NAFO Symposium on "Impact of Anomalous Oceanographic Conditions at the Beginning of the 1990s in the Northwest Atlantic on the Distribution and Behaviour of Marine Life" to be co-convened by E. Buch, A. Sinclair and M. Stein. Consequently it would be more suited for a 2-day meeting. STACFIS, agreed with the discussion on this matter at the Environmental Subcommittee Meeting (see Annex 1), and proposed that the meeting should be re-scheduled to 15 and 16 September 1994, and be held at NAFO headquarters. It is anticipated that the Symposium will include the 10-year review of the environmental conditions in the Northwest Atlantic.

2. **Progress Report on the September 1995 Special Session**

The proposed NAFO/ICES joint symposium on "The Role of Marine Mammals in the Ecosystem" was observed to progress well with the draft of the first announcement submitted by the co-conveners for consideration at this meeting. STACFIS was pleased with the proposed structure of the meeting and confirmed that the Symposium will be held in Dartmouth in conjunction with the NAFO Annual Meeting.

3. **Progress Report on the September 1996 Special Session**

This topic was addressed at the Scientific Council Meeting.

4. **Review of Arrangements for Conducting Stock Assessments and Documentation of Assessments**

STACFIS welcomed the changes to the terms of reference of the Standing Committees of the Scientific Council, as adopted by the Council during this meeting. STACFIS observed that the new Rules of Procedure for STACFIS will come into effect on 1 January 1995.

5. **Review of Report by the Joint ICES/NAFO Working Group on Harp and Hooded Seals**

STACFIS noted there was no meeting of this Working Group since October 1992. STACFIS also noted a request for advice on harp and hooded seals had been received from Denmark (Greenland) during this meeting and that the Scientific Council will request the Working Group to consider this matter in conjunction with the June 1995 Meeting.

X. ADJOURNMENT

In closing the meeting,the Chairman thanked all participants for their efforts and contributions to this meeting. He thanked the Assistant Executive Secretary and the staff of the Secretariat for the help and efforts in running an efficient meeting. Noting his term was coming to an end on September 1994, and that he may not have the opportunity to see several of the participants in September, he thanked all participants for their help and support during his term of office.

ANNEX 1

REPORT OF THE SUBCOMMITTEE ON ENVIRONMENTAL RESEARCH

Chairman: M. Stein Rapporteur: K. Drinkwater

The Subcommittee met at the Keddy's Dartmouth Inn at 9 Braemar Drive, Dartmouth, Nova Scotia, Canada, on 9 and 15 June 1994, to consider environment-related topics and report on various matters referred to it by STACFIS. Scientists attended from Canada, Cuba, Denmark (in respect of Faroe Islands and Greenland), European Union, Japan, Russia and the United States.

The Subcommittee reviewed the following documents: SCR Doc. 94/4, 10, 15, 16, 17, 19, 20, 21, 27, 28, 33, 36; SCS Doc. 94/3, 10, 11 and 12.

1. Chairman's Report

The Chairman welcomed everyone and reflected on his chairmanship over the last 10 years. He felt that during this time there had been increasing interest in climate issues, and while future environmental conditions are not predictable, progress has been made in describing climate trends. He looked forward to a continued discussion and cooperation between physical oceanographers and fisheries scientists in an attempt to solve some of the outstanding and important issues in fisheries today.

It was noted that beginning in January 1995, this Subcommittee under STACFIS will be discontinued and replaced by a Standing Committee of the Science Council. It will be called the "Standing Committee on Fisheries and Environment" (STACFEN).

The Chairman was pleased to note the reasonable number of papers relevant to the Subcommittee this year, in spite of the lack of a reminder to submit papers to the Environmental Subcommittee.

2. Invited Lecture by Dr. S. Goddard on Production of Antifreeze Proteins in Cod

The Chairman introduced the invited speaker Dr. Sally Goddard from the Marine Science Research Laboratory, Ocean Sciences Centre, Memorial University of Newfoundland, to the Subcommittee. He had invited her to speak after hearing her presentation at the Cod and Climate Symposium in Iceland last year.

Dr. Goddard began her talk by providing a brief history of the discovery of antifreeze in fish during the 1950s. Four different types of antifreeze proteins have since been found which inhibit the formation and growth of ice crystals in the blood of fish. This allows an increased tolerance to low water temperatures. Previous work by Dr. Gareth Fletcher and his co-workers in St. John's, Newfoundland, demonstrated that the antifreeze level in fish changes seasonally. Adults begin to produce antifreeze when water temperatures generally decrease below 0°C, reach maximum levels at the time of minimum temperature and production shuts off when the temperatures again rise above 0°C. Juveniles, on the other hand, begin production at higher temperatures and attain higher levels of antifreeze compared to adults. The difference between adults and juveniles is believed to be related to their migration patterns, as most adults migrate into warmer offshore waters in winter while juveniles overwinter in cold waters on the shelf. Studies on cod eggs show that they can withstand very cold temperatures (less than -5°C) unless the outer casing of the egg is damaged. Larvae can only withstand temperatures down to -1.3°C and therefore larvae may have high mortality under extreme cold water conditions and heavy ice.

Stress in fish is found to increase with exposure time to cold waters. Studies of cod in Trinity Bay, Newfoundland, in winter have shown that some fish will remain all winter, whereas most of the fish migrate offshore into warm waters. Those that stay, move to the bottom and begin in the autumn to produce antifreeze. They reach maximum levels of antifreeze by spring when they start to ascend towards the warmer surface waters.

She also reported that comparisons of ocean pout from waters off New Brunswick, Nova Scotia and Newfoundland have shown differences in antifreeze levels when exposed to the same water temperatures. These differences appeared to be due to genetic differences between fish from different regions. Differences in antifreeze levels were also found between cod at different latitudes, the higher values are found in the north.

Observations during the winters of 1991/92 and 1992/93 showed that the cod taken along the Avalon Peninsula had produced significantly higher levels of antifreeze proteins than during the previous 10 years although no significant change in water temperature was found. Dr. Goddard suggested that these fish may have immigrated from regions further north.

3. **NAFO Special Session**

The Chairman noted that the co-conveners of the Special Session on *Impact of Anomalous Oceanographic Conditions at the Beginning of the 1990s in the Northwest Atlantic on the Distribution and Behaviour of Marine Life*, scheduled for 14-16 September 1994, had only received a total of 10-12 requests to present papers. As a result a proposal being considered was to change the symposium to a one day meeting. He speculated that the much lower response than anticipated was most likely due to a combination of financial constraints and the large number of conferences and symposia that are scheduled around the same time, e.g. ICES Annual Meeting, Coastal Zone Canada Conference, etc. However, it was anticipated that some valuable information would be presented, particularly in respect of the 10-year summary of environmental conditions and the patterns of the fisheries in the Convention Area.

4. **Marine Environmental Data Service (MEDS) Report for 1993** (SCR Doc. 94/16)

During 1993-94, MEDS had been busy processing their backlog of data and improving their quality control (QC) procedures. A brief summary of the QC procedures was presented.

a) **Data Collected in 1993**

Data from 4 561 oceanographic stations collected in the NAFO area were sent directly to MEDS in 1993. An additional 4 629 stations were received through Integrated Global Ocean Service System (IGOSS). The exact number of stations occupied was not certain because all the data had not been received by MEDS.

The number of stations received directly by MEDS was an increase of about 50% of that obtained during 1992-93, while the number of stations obtained through IGOSS increased by nearly 1 000.

b) **Historical Data Holdings**

Data from 26 217 oceanographic stations collected prior to 1993 were obtained during 1993-94, an increase by a factor of approximately 6.

c) **Drift-buoy Data**

A total of 86 drift-buoy tracks were received by MEDS during 1993 representing 79 buoy months. This amounted to an increase of over 20% in both buoy releases and buoy months compared to 1992-93. Plots of the buoy tracks by season were presented.

d) **Wave Data**

During 1993-94, 84 864 wave spectra were again processed, due mostly to the permanent network of moored wave buoys in the area. This represented a 7% drop as compared to 1992.

f) **Environmental Conditions**

Investigations showed that the Levitus climatology for the NAFO region was inadequate to provide meaningful anomalies for an overview of environmental conditions. MEDS efforts have been directed instead to providing data on a timely fashion to other agencies such as the Bedford Institute of Oceanography for their reviews.

5. **Review of Environmental Studies in 1993**

a) **Subareas 0 and 1** (SCR Doc. 94/10, 17, 19; SCS Doc. 94/11)

During the annual EU-Germany groundfish survey (SCS Doc. 94/11) CTD measurements were taken at 55 fishing stations and along the NAFO standard sections off West Greenland (Fylla Bank and

Cape Desolation). An additional 54 XBT stations down to 750 m were taken in the eastern North Atlantic during trips to and from Greenland.

Monthly air temperature anomalies and changes in the ice cover in the northern North Atlantic were described (SCR Doc. 94/19). Extremely cold air temperatures (monthly mean anomalies of up to -8K)[1] were observed in winter off West Greenland, while above normal air temperatures persisted in September and October. Similar cold conditions in winter were observed in 1992 and during most of the previous decade. The cold winter was responsible for below normal annual mean temperatures in the region and continued the cooling trend at Nuuk on West Greenland which began in the late-1960s. The cold air led to more extensive ice cover than normal, with ice appearing off the southwestern tip of Greenland. Ice did not leave the Cape Farewell region until August and returned again by December. Ocean temperatures at Fylla Bank in autumn were above normal (by 1K in the top averaged over the top 50 m and 0.4K over 0-200 m). Warmer conditions were observed further to the south along the Cape Desolation transect. Slightly above normal temperatures in the top 200 m were also observed off East Greenland in the autumn of 1993.

Temperature measurements taken during studies of Greenland halibut (*Reinhardtius hippoglossoides*) off West Greenland were briefly described. As part of a trial fishery for Greenland halibut (SCR Doc. 94/10) several CTD stations were taken in Div. 1A and 1B. Summer data showed the typical structure of a cold intermediate layer (<-1°C) with a slightly warmer surface layer and warmer deeper water. Bottom temperatures taken during halibut studies in Div. 1A-1D for the years 1988 to 1993 were also provided (SCR Doc. 94/17).

b) **Subareas 2 and 3** (SCR Doc. 94/21, 27, 28 33, 36; SCS Doc. 94/3, 10)

Sea temperatures collected during the annual autumn Canadian groundfish survey in Div. 2J+3KL showed colder-than-normal upper layer temperatures in 1993 except near the coast where they were above normal (SCR Doc. 94/28). In the waters below 75 m, temperature anomalies continued to be between -1 and -2K. Similar to the years 1991 and 1992, large areas of the continental shelf had below normal bottom temperatures. The cold intermediate layer (CIL) over the northeast Newfoundland shelf and off Cape Bonavista was more extensive than normal in the autumn of 1993. The area of CIL waters increased over 1992 off Cape Bonavista but decreased along the Seal Island (Hamilton Bank) section. At Station 27 off St. John's, Newfoundland, negative temperature anomalies were observed at mid-depths and near bottom. In contrast, the near surface waters were slightly warmer-than-normal. Oxygen levels in the waters covering the Newfoundland shelves were generally above normal in the autumn of 1993.

Environmental conditions in the Newfoundland area during the spring of 1994 were described (SCR Doc. 94/27), including data taken during an oceanographic survey in May 1994. As in recent years, cold air temperatures persisted through the early months of 1994 resulting in more extensive ice cover than normal over the Newfoundland shelf. Temperature anomalies at Station 27 in the first 4 months of 1994 were colder-than-normal throughout the water column, except late in April when slightly warmer-than-normal values were observed over most of the top 100 m. Along the Flemish Cap section and the northern Grand Bank temperature anomalies varied with depth and horizontal position. Negative anomalies were observed along the Flemish Cap section in the surface layers over most of the transect, below about 90 m and along the edge of the Bank in the core of the Labrador Current. Positive temperature anomalies were recorded near the coast down to 100 m and over most of the Grand Bank at depths of approximately 30-90 m. Salinities were higher than the long-term mean near the coast and in the surface layers but lower in the bottom half of the water column and offshore. On the northern Grand Bank temperatures were primarily below normal with the maximum value (below -1°C) near the bottom at the edge of the bank in the Labrador Current. Positive temperature anomalies were observed nearshore and at mid-depths over the shallow regions of the Bank. Salinity anomalies were positive in the surface layers over the Bank and throughout the water column nearshore and offshore, but negative in the lower half of the water column and near the bottom at the Bank edge. The position of the offshore and inshore branches of the Labrador Current were clearly shown from acoustic doppler current measurements.

[1] Temperatures referred to as °C or K denote **measured** values in °Celsius or **derived** anomalies in Kelvin units.

Temperature and salinity data obtained from moored current meters on the NE Newfoundland Shelf and off southern Labrador (SCR Doc. 94/36) showed an annual cycle with a very peaked maximum. At 75 m the maximum occurred in November or December. At deeper depths the maximum, if any, typically occurred slightly later. The precise timing of the maximum also varied year-to-year. At many locations the amplitude of the high frequency variability was of the same order as the annual cycle, especially near the shelf edge and in the saddles. Therefore, measurements taken by ships in those locations approximately at the same date each year had the potential to be biased.

An analysis of the influence of geostrophic current patterns on cod egg distributions on the Flemish Cap was presented (SCR Doc. 94/33). Earlier studies based upon oceanographic surveys between 1978 to 1984 had identified four circulation types; Cap-wide anticyclonic circulation, anticyclonic circulation with several centres of rotation, meanders across the Cap with an eastward flow, and a mixture of anticyclonic and eastward flow. It had further been suggested that the anticyclonic flow regimes favoured egg and larval retention while the eastward flow tended to sweep ichthyoplankton off the Cap. In the paper, the authors suggested that eastward circulation may transport eggs onto the Cap, and this may have occurred in March of 1980 and 1981. High recruitment in 1986, when the circulation pattern was again generally eastward, was also suggested as possibly having arisen due to a transport of eggs from the Flemish Pass area onto the Cap.

Studies of otoliths from Flemish Cap cod (SCR Doc. 94/21) were used to assess the possibility of immigration of adult cod onto Flemish Cap between 1980 and 1989. The otolith rings showed similarities in size between different fish of different ages suggesting they were subject to the same environmental conditions of certain years (e.g. 1990). The authors concluded that the ring structures were related to environmental changes on Flemish Cap.

Results of an oceanographic survey in April to July on the Grand Banks and Flemish Cap (SCS Doc. 94/3) showed that bottom waters over the Grand Banks were typically colder and fresher than normal, the major exception occurring along the southern edge of the Bank and the Tail of the Bank, where conditions were warm and salty due to influence of slope waters.

The Canadian research report (SCS Doc. 94/10) noted that the time series of moored current meters on Hamilton Bank was continued in 1993 and that several clusters of satellite-tracked surface drifters were deployed.

c) **Subareas 4, 5 and 6** (SCR Doc. 94/4, 15; SCS 94/3, 10, 12)

Near bottom temperature data along the continental break of the Scotian Shelf were presented as part of a study on the distribution of silver hake (SCR Doc. 94/4). Feeding and prespawning aggregations of silver hake were observed in warm offshore waters in temperatures of 7-10.5°C. On the eastern half of the Scotian Shelf a near bottom front occurred between the cold intermediate waters on the banks and the warm offshore slope waters. Silver hake were not found in the colder shelf waters.

Analysis of sea surface temperatures in the region showed an increase from 1992 over the Scotian Shelf, in the slope waters off the Scotian Shelf and in the Labrador Sea north of the Grand Banks (SCS Doc. 94/3). Negative temperature anomalies were observed on the Grand Banks.

The Canadian research report indicated that circulation models are being used to investigate egg and larval drift with emphasis presently on Georges Bank (SCS Doc. 94/10). Long-term monitoring of zooplankton populations on the Scotian Shelf and in the Gulf of Maine was continued in 1993.

Monthly monitoring of surface and bottom temperatures on a transect across the Middle Atlantic Bight showed generally cooler-than-normal conditions, by upwards of 1.4K at the surface (SCR Doc. 94/15). Below normal temperatures were also found in the Gulf of Maine but of lower magnitude. Bottom temperatures in Crowell Basin were, however, warmer than normal. Surface salinities were below average for 1993 in both the Middle Atlantic Bight and in the Gulf.

Hydrographic surveys were conducted by U.S. scientists on Georges Bank as part of a herring study in January, November and December 1993, and over the entire shelf from Cape Hatteras to the Gulf of Maine in the spring and autumn 1993 in conjunction with bottom trawl surveys (SCS Doc. 94/12).

6. **Overview of Environmental Conditions in 1993** (SCR Doc. 94/20)

A review paper was presented based on several long-term oceanographic and meteorological data sets as well as summarized results from available research documents. Highlights for 1993 not covered in Section 3 are listed below.

a) Extremely cold air temperatures were again observed over southern Labrador and Newfoundland especially in winter, due in part to an intensification of the atmospheric circulation pattern. One index of the latter was the North Atlantic Oscillation (NAO) anomaly, which was strongly positive.

b) Similar to 1992, ice formed early, spread more rapidly, was of greater concentration and lasted longer than normal off southern Labrador, Newfoundland and in the Gulf of St. Lawrence.

c) The number of icebergs to reach south of 48°N during 1993 rose compared to 1992 but was slightly less than the recent maximum in 1991. It was the second highest number of bergs detected since the introduction of side-looking airborne radar 8 years ago.

d) Below normal temperatures were observed throughout most of the water column at Station 27. For the near bottom waters this continues a trend that has lasted ten years.

e) The areal extent of the CIL water in summer was greater than normal and had increased slightly or remained the same as in 1992.

f) In offshore waters, cold sea surface temperatures were found off Cape Farewell in Greenland, on the eastern Grand Banks and Flemish Cap, in the Gulf of Maine and on Georges Bank. Warm conditions were recorded in the Labrador Sea, on the Labrador Shelf, the Scotian Shelf and the Middle Atlantic Bight. The warmest conditions were observed in the slope waters off the Scotian Shelf.

g) Annual coastal sea temperatures at Halifax and St. Andrews were slightly below normal and about normal at Boothbay Harbor in 1993.

h) Deep water temperatures on the Scotian Shelf (Emerald Basin) and in the Laurentian Channel at Cabot Strait were above normal and increased over the 1992 temperatures.

i) Cold waters were observed in the 50-100 m depth range over the Scotian Shelf with several regions reaching anomalies equivalent to that recorded in the 1960s. The decline in temperature had begun in the mid- to late-1980s. In contrast, slope waters off the Scotian Shelf appear to be warm in the upper 200-300 m.

j) The Shelf/Slope front and the Gulf Stream were both north of their long-term mean locations.

7. **National Representatives**

No changes were reported to the national representatives responsible for submitting oceanographic data to MEDS. The representatives are:

G. Glenn (Canada), R. Dominguez (Cuba), E. Buch (Denmark), A. Battaglia (France), R. Leinebo (Norway), A.J. Paciorkowski (Poland), F. Troyanovsky (Russia) and G. Withee (USA). The representative for the United Kingdom is unknown.

8. **Joint Russian/German Data Evaluation (ICNAF/NAFO data, status report)**

At the June 1993 meeting it was noted that a cooperative program between Russia and EU-Germany was being explored to retrieve hydrographic data from the Russian central archives. The Chairman reported that a 3-year program might get funding from 1995 onwards, that will allow German and Russian scientists and technicians to obtain and evaluate the historical hydrographic data collected by the former USSR.

9. Other Matters

Dr. Goddard was again thanked for her presentation. It was **recommended** that *similar invited talks on topics related to environmental influences on fisheries should be an ongoing annual feature.* This was generally agreed to by the Subcommittee and the Chairman offered to arrange such for next year's meeting and to discuss with the Secretariat the possibility of obtaining funds to help offset costs of such lecturers, if required.

10. Acknowledgements

The Chairman closed the meeting by thanking the participants for their contributions and cooperation.

APPENDIX II. REPORT OF STANDING COMMITTEE ON RESEARCH COORDINATION (STACREC)

Chairman: C. A. Bishop Rapporteur: E. F. Murphy

The Committee met at the Keddy's Dartmouth Inn, 9 Braemar Drive, Dartmouth, Nova Scotia, Canada on 15 and 17 June 1994, to discuss various matters pertaining to statistics and fisheries research in the Regulatory Area. Representatives from Canada, Cuba, Denmark (in respect of Faroe Islands and Greenland), European Union, Japan and Russian Federation and an observer from the United States of America were present.

1. Fisheries Statistics

a) Progress Report on Secretariat Activities in 1993/94

i) Acquisition of STATLANT 21A and 21B reports for recent years

STACREC remained concerned about the ongoing delays in receipt of national statistical reports. A list of STATLANT 21A and 21B reports that had not yet been received for 1991 and 1992 are shown in Table 1. The 1993 STATLANT 21A reports have not been received for many components and this meant that the update of fisheries trends could not be produced for this June meeting. STACREC was seriously concerned that a major component of NAFO statistics were not available since 1988 from EU-France and **recommended** that *the Scientific Council take steps to obtain these data to complete the database and update statistical bulletins.*

Table 1. List of STATLANT 21A and 21B reports which have not been submitted for 1991 and 1992.

STATLANT 21A		STATLANT 21B	
1991	1992	1991	1992
EU-France (M) France (SP)	EU-France (M) France (SP) Lithuania	EU-Denmark France (SP) Norway (Partial) USA	Canada-M Canada-N EU-Denmark EU-France (M) France (SP) Lithuania USA

ii) Acquisition of statistical information from other NAFO Standing Committees

STACREC had been informed (September 1993) that there was no problem in using data contained in Working Papers produced by other Standing Committees, namely STACTIC and STACFAC. Data contained in these papers could be requested directly from the Secretariat for use in stock assessments.

STACREC noted that the reports from these Committees should be reviewed and the reports and/or lists of Working Papers should be distributed to national representatives and designated experts prior to assessment meetings to evaluate their usefulness. It was noted that the documents from NAFO Constituent Bodies and Standing Committees are routinely made available for reference at the Scientific Council Meeting by the Secretariat.

iii) Publication of statistical information

STACREC again noted that late submission of STATLANT reports (Table 1) continued to affect timely production of statistical bulletins. *NAFO Statistical Bulletin* (40) containing the 1990 data was published in February 1994 without data from EU-France (M) and France (SP).

The problem of misallocation of roundnose and roughhead grenadier catches was discussed by STACREC in June 1993, particularly with regards to Portuguese and Spanish catches. Data were presented at this meeting suggesting that this problem has been resolved. STACREC suggested that the corrected data should be forwarded by the Secretariat to statistical offices of EU-Spain and EU-Portugal so that they may be confirmed as official statistics.

STACREC reviewed the Secretariat's decadal catch summary (SCS Doc. 94/1) and indicated that the document receives considerable use. Some changes and/or additions to the present format were suggested. These included that catch be reported by NAFO Div. rather than Stock area, as well as some streamlining of the tables to exclude those countries perpetually reporting zero catches. It was suggested that representatives consider the matter and prepare proposals for future consideration by STACREC.

b) **Deadlines for Submission of STATLANT 21A and 21B Data**

The Chairman noted that there may have been some uncertainties regarding the deadlines for submission of STATLANT 21A and 21B data. This issue was discussed at this meeting to provide clarification of the current status. Although STACREC recommended in 1993 that Rule 4.4 be changed to May 30 and August 31, in response to EU-EUROSTAT concerns, STACREC confirmed that NAFO submission deadlines are as stated in the Scientific Council Rules of Procedures, Rule 4.4: May 15 for STATLANT 21A and June 30 for STATLANT 21B. This Rule 4.4 remains in effect for NAFO submissions as this was ratified by the General Council in September 1992.

c) **Preparation for the CWP 16th Session**

i) STACREC was informed that an *ad hoc* Inter-Agency Consultation meeting sponsored by FAO was held in La Jolla, California in December 1993, on the role of regional fishing agencies in relation to high seas fishing statistics. The Assistant Executive Secretary attended this meeting upon the invitation of FAO. Items addressed included the requirements for statistics on high sea fisheries for research and management purposes, the type of statistics to be collected, collated and disseminated by FAO, arrangements for reporting statistics, and arrangements for exchanging information. The issue of extending the brief of the CWP on Atlantic Fisheries Statistics to areas outside the Atlantic Ocean was also addressed. STACREC was informed that the report of this meeting was available at the Secretariat.

ii) STACREC noted that the Assistant Executive Secretary was invited to FAO to investigate discrepancies between the NAFO database and the FAO database. The Assistant Executive Secretary reported that the majority of the discrepancies were resolved and a process devised to ensure that the NAFO database is compatible to the FAO database for the STATLANT 21 area.

iii) STACREC noted that an *ad hoc* Consultation of the CWP participating regional fisheries agencies was scheduled for July 1994 in place of the Sixteenth Session of the CWP as discussed by STACREC in 1993. This *ad hoc* Consultation has been primarily designed to discuss possible revisions to CWP statutes and rules of procedure. Consultation with NAFO Contracting Parties indicated that a clear picture of the role of CWP was necessary before discussions are made on revising statutes. Any attendee would require a clear mandate on policy making. It was considered that the matter be dealt with at General Council with possible participation by a General Council representative. STACREC noted that CWP has been a productive Working Party and maintaining the informal nature of its functions should be a primary consideration.

NAFO has indicated that the Assistant Executive Secretary would not be attending this *ad hoc* consultation, but would attend the 16th Session of the CWP, as originally intended.

STACREC noted it maintains its full interests in the work of the CWP, and reconfirmed that attendees (STACREC Chairman, C. A. Bishop; Assistant Executive Secretary and the representative from Spain, E. de Cardenas) slated to attend the 16th Session of the CWP will be **recommended** to attend that meeting now scheduled for February 1995 in Madrid, Spain.

2. Biological Sampling

a) Report on Activities in 1993/94

The Provisional List of Biological sampling for 1992 was tabled (SCS Doc. 94/8).

It was noted the Inventory of Sampling Data for the period 1985-89 was published in March 1993. The next issue of the 5-year publication will be considered by STACREC at its meeting in June 1995.

b) Report by National Representatives

National representatives reported on their sampling programs of commercial fisheries for 1993/94 as follows:

Cuba. No sampling.

Canada. Canadian commercial fisheries in 1993 were reduced because of a moratorium and reduced TACs. Data relative to length and age were collected for most commercial catches as required from Subareas 2 and 3. Sampling at sea was accomplished by observers and additional sampling was conducted on the Div. 2J and 3KL non-commercial cod fishery.

Denmark-Greenland. Biological samples were obtained in 1993 from the commercial fishery in Subarea 1 and Denmark Strait (ICES XIV).

- **Shrimp, offshore (Div. 1A-1F, ICES XIV)**. Shrimp were sexed and carapace length measurements were collected from catch (directly from trawl).

  The most important fishing areas and periods were covered. Sampling in Subarea 1 covered Div. 1B, 1C, 1D and 1E in the 1st quarter and Div. 1B, 1C and 1D in the 3rd and 4th quarter, whereas sampling in ICES XIV covered the 1st and 2nd quarter.

- **Greenland halibut, inshore (Div. 1A)**. Length measurements and otoliths were taken from landings, covering the inshore gillnet/longline fishery. Sampling was extended in 1993 and covered the three important fishery areas, summer and winter.

- **Greenland halibut, offshore (Div. 1B-1D)**. Length measurements were taken from the catch aboard a Norwegian trawler.

- **Cod inshore (Div. 1B-1F)**. Length measurements and otoliths were taken from landings, covering the inshore poundnet fishery from May to September (the main part of the cod fishery in 1993).

EU-Denmark. No sampling.

EU-France. No sampling, no fishing.

EU-Germany. No sampling, no fishing.

EU-Portugal. During 1993 biological sampling was obtained from one stern trawl fishing in all Divisions from January to June and two gillnetters operating between April and August, one mainly in Div. 3M and the other in Div. 3N/3O. Catch and effort data were also obtained from these vessels through direct consultation, or the captain's logbook records, as in previous years. In addition to this, statistical information on catch and effort from one trawler and one gillnetter fishing in the NAFO area was also made available by the respective captains, on a trawl by trawl basis.

Biological sampling was conducted for the most abundant species in each haul following the NAFO sampling recommendations. Cod, redfish (*S. mentella*), American plaice and Greenland halibut were the main species sampled in three trawl vessels sampled. For the gillnet sampling, besides cod, redfish (both *S. mentella* and *S. marinus*) and American plaice, red hake was also sampled.

In order to assess the impact of the redfish trawl fishery on the cod stocks, cod by-catch rates were also estimated in 1993, below and above the 400 depth line. Also by-catches of cod on directed fishing for Greenland halibut was assessed by month and Division.

EU-Spain. During 1993 sampling for the catches by Spanish fleet was obtained by observers on board. Length and age samples were obtained for Greenland halibut, American plaice and cod. Coverage included 10 pair trawler units (3 observers of 3 months each), 12 small freezer trawlers, and 22 large freezer trawlers (1/3 of total year covered).

Japan. No sampling.

Russian Federation. Data were obtained relative to length and age for silver hake in Subarea 4.

c) **Data Necessary for Stock Assessments**

The available data from commercial fisheries by stock, relative to the assessments are given in Table 2.

Table 2. Available data from the commercial fisheries related to stock assessment (1993).

				Biological Sampling				
Stock	Country[1]	Catch	CPUE	Sex	Length	Age	Individual Weight	Maturity
2J3KL cod	CAN	9 000		X	X	X	X	X
	E/ESP	2 200			X			
	OTHER	225						
3M cod	E/PRT	3 130	X		X	X		
	E/ESP	2 249			X	X		
	OTHER	7 000						
3NO cod	CAN	5 326		X	X	X	X	X
	E/PRT	521	X	X	X	X	X	
	E/ESP	3 031		X	X	X	X	
	RUS	150						
	OTHER	700						
SA 1 redfish	GRL	299[2]						
3M redfish	CUB	945	X					
	EST	2 188[3]						
	JPN	967						
	LAT	6 875[3]						
	LTU	2 190[3]						
	NOR	37[3]						
	RUS	2 035	X					
	E/ESP	100		X	X			
	E/PRT	4 781	X	X	X	X	X	
	OTHER	4 138[1,3]						
	TOTAL	24 256[1,3]						
3LN redfish	CAN	45	X	X	X	X		
	E/PRT	253	X	X	X			
	E/ESP	36			X			
	EST	1 926						
	LAT	3 403						
	LTU	1 790						
	JPN	36						
	RUS	5 619	X		X			
	KOR-S	708						
	OTHER[4]	3 627-9 427						

Table 2. Continued.

Stock	Country[1]	Catch	CPUE	Biological Sampling: Sex	Length	Age	Individual Weight	Maturity
4VWX silver hake	RUS	7 139	X	X	X	X	X	X
	CAN	73	X	X	X			X
	CUB	22 018	X	X	X	X	X	X
3M American plaice	E/PRT	75[3]		X	X		X	
	E/ESP	100[3]		X	X	X	X	
	OTHERS	100[3]						
3LNO American plaice[5]	CAN	7 585	X	X	X	X		
	KOR-S	13						
	E/PRT	50[3]	X	X	X	X		
	E/ESP	525[3]		X	X			
	USA	84						
	OTHER	9 000						
3NO witch flounder	CAN	4 337	X	X	X	X		
	E/PRT	245						
	E/ESP	7						
	RUS	3						
	USA	12						
3LNO yellowtail flounder[6]	CAN	6 697	X	X	X	X		
	USA	68						
	OTHER	6 800						
SA 1 Greenland halibut	GRL	918						
	JPN	1 434		X	X	X	X	X
	NOR	1 775	X		X			
	FRO	113						
	E/DEU	49						
SA 0 G. halibut	CAN	7 613	X		X	X	X	
SA 2+3 Greenland halibut	CAN	5 128	X	X	X	X		X
	E/ESP	35 640	X	X	X	X		
	E/PRT	8 808	X	X	X			
	JPN	2 919						
SA 2+3 roundnose grenadier	E/ESP	4 281						
	JPN	127						
Div. 3NO Capelin				Fishery closed. No catches reported.				
SA 3+4 Squid	CAN-N	261		X	X			X
	CAN-M	34						
	CUB[7]	2 358	X[7]					
	RUS[7]	92						

1 OTHER refers to estimates of non-Contracting Parties who did not report catches to NAFO.
2 By-catch of small redfish taken by the shrimp fishery is believed to be substantial in number and not reported.
3 Data of Canadian surveillance.
4 OTHER - Non-reported catch could not be precisely estimated but is considered to be in this range.
5 Actual total catch may be 2 100 tons higher.
6 Actual total catch may be 200 tons higher.
7 By-catch in silver hake fishery. Effort is directed for silver hake.

d) Assessment Data Needs in Relation to Research in the Regulatory Area

There were some concerns expressed relative to the identification of specific assessment data needs in the Regulatory Area. There was still a lack of data from non-Contracting Parties who continue to catch substantial amounts of various species in the Regulatory Area.

3. Biological Surveys

a) Report on the Activities in 1993

An inventory of biological surveys conducted in 1993, as submitted by National Representatives and Designated Experts, was presented by the Secretariat (Table 3). Designated Experts also provided a more detailed account of the survey data available for 1993 relative to their stocks.

Table 3. Inventory of biological surveys conducted in the NAFO Area during 1993.

Subarea	Division	Country	Months	Type of survey	No. of sets
				Stratified-random Surveys	
1	A-F	GRL	7-9	Shrimp and groundfish	187
	B-D	GRL/JPN	8-9	Greenland halibut	87
	B-F	DEU	10	Groundfish, Oceanography	
2+3	JK	CAN-N	10-12	Groundfish	
3	L	CAN-N	5,8,10	Crab	
	L	RUS	5-6	Groundfish, temperature, salinity	74
	LNO	CAN-N	4-6	Groundfish	
			8	Redfish	
			8-9	Juvenile flatfish	
	M	E/ESP	6-7	Groundfish	101
		RUS	4-7	Groundfish, temperature salinity	69
		CAN-N	10-12	Groundfish	
	N	RUS	5	Groundfish, temperature, salinity	80
	O	RUS	5	Groundfish, temperature, salinity	78
	P	CAN-N	4	Groundfish	
	Ps		5	Scallops	
			7-8		
3+4	PN+RST	CAN-Q	8	Shrimp-redfish assessment	241
4	R	CAN-Q	5	Cod egg/larval survey	69
			6	Cod egg/larval survey	49
			9	Cod juvenile survey	39
	S		7	Stimpson's clam assessment	70
			7	Crab assessment	n/a
	T		6	Mackerel egg survey	125
			9	Scallop assessment/acoustics	109
				Other Surveys	
1	A	GRL	7-9	Greenland halibut longline inshore	52
	A-D	GRL/NOR	5-8	Greenland halibut longline offshore	44
	B-F	GRL	6-7	Juvenile cod, inshore gillnets	170

Table 3. Continued.

Subarea	Division	Country	Months	Type of survey	No. of sets
2+3	HJKL	CAN-N	7	Oceanography	
	JKL		8-10	Capelin acoustic	
			12-1	Juvenile cod	
	JKLPs		10-11	Oceanography	
3	KL	CAN-N	4-5,5-6,9-10	Oceanography	
			5-6	Cod tagging	
			6	Cod acoustics	
			9-10	Juvenile cod and capelin	
			11-12	Herring acoustics	
	KLP		5-6,10	Acoustic calibration	
	L	CAN-N	5,6, 8-9,9, 10,12	Oceanography	
			6	Trawling impact on cod spawning	
			6	Cod and capelin acoustics	
			6-7	Cod acoustics	
			7	Ichthyoplankton	
			7	Trawling impact on benthos	
			9,9-10	Gear trials	
			9	Crab	
			10-11	Juvenile cod	
	LNO	CAN-N	6	Flatfish tagging	
		RUS	6	Capelin, temperature,	~316
3+4	OVW	CAN-SF	6,9	Trawling impacts	
4	R	CAN-Q	10	Herring acoustics	n/a
	S		6	Crab recruitment	n/a
			9	Crab recruitment	n/a
	T		5	Lobster assessment	n/a
			6	Mackerel fecundity+selectivity	n/a
			9	Lobster assessment	n/a
	VN		5	Mackerel acoustics	n/a
	VWX	CAN-SF	5	Scallop	
	W		1	Herring acoustic	
			10	Juvenile silver hake	
	X		5	Globec plankton cruise	
			10	Globec Moorings	
			10-11	Herring larvae	
5	Z	CAN-SF	8	Scallop	
			11	Herring resurgence	

b) **Surveys Planned for 1994 and Early-1995**

An inventory of biological surveys planned for 1994, as submitted by National Representatives and Designated Experts, was presented by the Secretariat (Table 4).

Table 4. Biological surveys planned for the NAFO Area in 1994 and early-1995.

Country	Area	Type of Survey	Dates
		Stratified-random Surveys - 1994	
CAN-N	2J+3K	Groundfish	Nov-Dec
	3L	Crab	May, Aug, Sep-Oct
		Scallops	Jul
	3LNO	Groundfish	Apr-Jun, Oct-Dec
		Juvenile flatfish	Sep-Oct
	3P	Groundfish	Apr
	3Ps	Scallops	May
	3P+4V	Redfish	Aug
CAN-SF	4VW	Groundfish	Feb, Jul
	4X	Groundfish	Jul
	5Z	Groundfish	Feb
CAN-Q	3Pn+4RS	Groundfish	Jan
	4R	Cod production/acoustics	Feb 2-May 14
		Cod larval survey	May 3-20
		Cod juvenile survey	Sep 19-Oct 7
	4S	Stimpson's clam assessment	Jun 12-25
		Crab assessment	Jul 28-Aug 13
	4T	Mackerel egg survey	Jun 14-28
		Scallop assessment/acoustics	Aug 28-Sep 10
	4RST	Shrimp-redfish assessment	Aug 15-Sep 9
EU	3M	Groundfish	Jul
E/DEU	1B-F	Groundfish, oceanography	Oct-Nov
GRL	1A-F	Shrimp and groundfish	Jul 9-Oct 10
GRL+ JPN	1A-D	Greenland halibut	Aug 1-21
JPN	1NK	Bottom trawl survey on G. halibut	
RUS	3L	Groundfish,temperature, salinity	Jun - Jul
	3M	Groundfish,temperature, salinity	Jul
	3N	Groundfish, temperature, salinity	Jun
	3O	Groundfish, temperature, salinity	Jun
		***Other Surveys* - 1994**	
CAN-N	2J+3KL	Cod acoustics	Jun
		Oceanography	Jun
		Juvenile cod and capelin	Aug-Sep, Dec-Jan
		Capelin acoustics	Sep-Oct
	3K	Herring acoustics	Nov-Dec
	3KL	Seals	Feb
	3KLMN	Greenland halibut	Feb
	3KLP	Acoustic calibration	May-Jun, Oct-Nov
	3L	Oceanography	Jan, Feb, May, May-Jun, Jul, Sep, Nov
		Cod tagging	Feb, May-Jul
		Trawling impact on benthos	Jun-Jul
		Capelin acoustics	Jul
		Ichthyoplankton	Jul-Aug

Table 4. Continued.

Country	Area	Type of Survey	Dates
CAN-N	3L	Crab	Aug, Sep
		Cod acoustics and tagging	Oct
		Gear trials	Oct-Nov
	3LN	Gear trials	Jan-Feb, Jul
	3LPs	Herring acoustics	Jan-Feb
CAN-SF	3O	Trawling impacts	Jul
	4VWX	Scallop survey	May
	4W	Fish sampling	May
		Zooplankton	Jun
		Gear trials	Jun
		IYGPT trawl survey	Nov
	4X	Herring larvae	Oct
	5Z	Acoustic, trawling, tagging	Mar
		Scallop research	Aug
		Herring resurgence	Nov
CAN-Q	4S	Crab recruitment	Apr 25-May 13
		Crab recruitment	Jul 18-27
		Crab recruitment	Sep 25-Oct 8
		Crab recruitment	Oct 9-19
	4T	Mackerel fecundity+selectivity	Jun 10-24
		Lobster assessment	Sep 11-24
GRL	1A	Greenland halibut inshore, longline	Aug-Sep
		Snow crab	Aug
	1B-F	Juvenile cod inshore, gillnets	Jun-Jul
	1E-F	Snow crab	Jun
RUS	3LNO	Capelin, temperature, salinity	Jun
		Surveys Planned for Early-1995	
CAN-N	2J3KL	Cod acoustics	Jan
		Cod tagging	Jan-Feb
	3L	Oceanography	Jan-Feb
	3Ps	Herring acoustics	Jan
GRL+ NOR	1D	Greenland halibut, longline offshore	Jan

c) **Review of Stratification Schemes**

A document (SCR Doc. 94/43) was presented describing revisions and additions to the stratification scheme used for stratified-random groundfish surveys in Subareas 2 and 3. Charts in Div. 2G and 2H were completed (strata units added) while those in Div. 2J and part of Div. 3K were revised because of the availability of revised and more accurate charts which indicated that those originally used contained many errors. Stratification charts for Div. 3L, 3M, 3N, 3O, and 3P were extended to include depth zones from 400 to 800 fathoms. Those for Div. 3O and Div. 3P also had minor revisions to several strata on the edge of the banks because of errors in the charts originally used. The stratification scheme in Div. 3P was also extended to some inshore areas in Placentia Bay.

STACREC noted that the revised stratification is currently being used by Canada and is available for use by other Contracting Parties.

d) **Coordination of Surveys**

In June 1993 the Scientific Council proposed that consideration be given to implementation of a joint multinational trawl survey, particularly noting there were a number of different initiatives taking place in Subareas 2-3 for Greenland halibut. Information provided by EU-Spain indicated that they will propose to the EU to conduct a survey (1995) in Div. 3M, 3L, 3N and 3O in depths from 700 to 2 000 m.

Greenland with Japan will conduct a survey for Greenland halibut in Subarea 1 during 1994 at depths from 400 to 1 500 m. STACREC **recommended** that *this initiative be discussed and coordinated with other interested countries.*

4. **Non-traditional Fishery Resources in the NAFO Area**

a) **Statistics and Sampling**

It was noted in the 1993 STACREC report that the shrimp fishery that developed in 1993 in the Flemish Cap area could take significant numbers of finfish as by-catch. STACREC advised that information on the levels and species of this by-catch needs to be monitored to determine impacts on assessed stocks.

b) **Survey Data**

i) **Species encountered in surveys**

STACREC observed there has been a need in the past for information on some non-traditional species (e.g. skate). This information would be best obtained from research surveys. STACREC suggested that there is a need to give additional consideration to determining abundance and distribution of non-traditional species. The status of these species could change as traditional species decline.

ii) **Feasibility of having set-by-set data on non-traditional species**

STACREC was presented with a proposal that basic survey data from traditional stratified-random surveys be provided to the Secretariat, to facilitate *ad hoc* determination of distribution and abundance of non-traditional species as might be required. STACREC did not discuss this topic to any extent but proposed that representatives address this for future consideration.

5. **Other Matters**

a) **List of Fishing Vessels for 1992**

The Secretariat could not provide a list of fishing vessels for 1992 because reports were still outstanding for 11 countries. STACREC requested the representatives ensure the data are submitted.

b) **List of Tagging Activities**

The Secretariat compiled a list of tagging activities in 1993 (SCS Doc. 94/7). Representatives were requested to check the list and report any errors or omissions.

c) **Update of Information on Conversion Factors**

At its meeting in September 1993, STACREC reported that FAO was in the process of revising their previously published document on conversion factors and the information should be obtained from that update before further work on compilation of conversion factors was attempted. The Secretariat has since been informed that the information is not yet available. The 1993 report of CWP also indicated that the Working Party had made a similar request to FAO. STACREC **recommended** that *further work on conversion factors would not be required at the Scientific Council level until the status of the FAO report was determined.* It also suggested that the Secretariat obtain further information on the progress from FAO.

d) **Other Papers**

STACREC tabled for review, eight papers not related to stock assessments, which were traditionally considered in STACFIS (SCR Doc. 94/5, 11, 24, 26, 29, 34, 35, and 38). Sufficient time for adequate review was not available at this particular meeting and STACREC deferred the review to the September 1994 Annual Meeting. STACREC hoped that such reviews in future would be done in June to ensure adequate peer-review.

e) **Pilot Observer Program**

Contracting Parties, through STACTIC, set up a Pilot Observer Program in 1993 which has been extended into 1994. Information from this program has not been made available to STACREC for review. STACREC noted that this information may be quite useful with regards to stock assessments and **recommended** that *the Scientific Council determine if the data from the Pilot Observer Program can be made available for assessment purposes.*

6. **Acknowledgements**

The Chairman thanked the Secretariat for their assistance in compiling all the pertinent information for the meeting. As there was no further business, the meeting was adjourned.

APPENDIX III. REPORT OF STANDING COMMITTEE ON PUBLICATIONS (STACPUB)

Chairman: W. R. Bowering Rapporteur: K. H. Nygaard

The Committee met at the Keddy's Dartmouth Inn, 9 Braemar Drive, Dartmouth, Nova Scotia, Canada on 13 and 18 June, 1994. In attendance were W. R. Bowering (Canada, Chairman), J. M. Morgan (Canada), V. A. Rikhter (Russian Federation), M. Stein (EU-Germany), A. Vazquez (EU-Spain), K. H. Nygaard (Greenland) and the Assistant Executive Secretary (T. Amaratunga).

1. Review of STACPUB Membership

The Scientific Council at its meeting in September 1993 agreed to undertake its review of northern shrimp at Special Meetings in November. As a result P. Kanneworff (Greenland) informed STACPUB he would no longer attend the June Meetings. Accordingly, he had been replaced by K. H. Nygaard (Greenland) by the Scientific Council. While extending its appreciation to P. Kanneworff for his services in STACPUB, K. H. Nygaard was welcomed to the Committee. Further J. M. Morgan (Canada) substituted for J. E. Carscadden (Canada) for this meeting. The Scientific Council on 17 June 1994 had been informed by J. E. Carscadden (Canada) that he was not likely to attend the June Meetings in the foreseeable future, and the Council replaced him by J. M. Morgan (Canada). STACPUB extended its appreciation to J. E. Carscadden for his services and welcomed J. M. Morgan.

2. Review of Scientific Publications Since June 1993

a) Journal of Northwest Atlantic Fishery Science

STACPUB noted Volume 15, containing the paper on "Decapod Crustacean Larvae from Ungava Bay" by Hubert J. Squires, and 3 notices (169 pages) was published with the publication date of December 1993.

Volume 16 containing 6 miscellaneous papers was in the final stages of preparation. This issue was expected to be completed by mid-1994.

Volume 17, containing papers presented at the November 1990 Canada-USSR Meeting on Capelin, had 5 papers in the final stages of preparation. This issue was expected to be completed by mid-1994.

STACPUB also noted the special issue of the Journal containing papers presented at the NAFO 1993 Symposium was also in progress after a short delay in the editorial process.

b) NAFO Scientific Council Studies

Studies Number 19, containing 8 miscellaneous papers and 3 notices (97 pages) was published with the publication date of October 1993.

Studies Number 20, containing 7 miscellaneous papers was published with the publication date of February 1994.

STACPUB noted a group of 13 papers (SCR Documents) dealing with Northern Cod presented in June 1993 had appeared suitable for a single issue of Studies. STACPUB was pleased that of those 13 papers, 8 papers plus 1 abstract were submitted by the coordinator J. S. Campbell (Canada) to the Secretariat on 25 May 1994 to be published. The publication of this issue is expected to be completed by the end of 1994.

There are currently 3 miscellaneous papers in hand at the Secretariat which are in the process of being edited.

c) **NAFO Statistical Bulletin**

NAFO Statistical Bulletin, Vol 40 for 1990 was published without EU-France Metropolitan and France (St. Pierre and Miquelon) data, in February 1994 (309 pages). These data were still not available.

STACPUB noted that the delay in the acquisition of final data had delayed the timely publications of Bulletins, Vol. 41 and Vol. 42.

d) **NAFO Scientific Council Reports**

The volume (234 pages) containing reports of the 1993 meetings of the Scientific Council in June, September and November was published and distributed in January 1994, instead of the usual publication month of December. The Secretariat had found it more appropriate to wait until the year ended before the Scientific Council Reports for each year was published.

e) **List of Fishing Vessels**

This triennial publication with data for 1992 was due to be published last year, but data were still outstanding from many countries. STACPUB noted this matter was being addressed by STACREC.

f) **Inventory of Sampling Data**

Inventory of Sampling Data, 1985-89 was published in March 1993. The next issue for 1990-94 is targeted for 1996.

g) **Index of Journal and Studies**

STACPUB was pleased that in accordance with the Scientific Council decision, the Index of Journal of Northwest Atlantic Fishery Science and NAFO Scientific Council Studies, 1980-93 (62 pages) (since NAFO replaced ICNAF) was completed and published by the Secretariat in February 1994.

3. **Production Costs and Revenues for Scientific Council Publications**

a) **Publication Costs and Revenues**

The production costs and the revenues for the various publications related to the activities of the Scientific Council were reviewed by STACPUB. No significant departures from those of previous years were observed. However, a new billing procedure which requires advance payment from recipients, and the ongoing review of the Secretariat mailing list, had resulted in a decrease of copies sent out.

b) **Microfiche Project**

STACPUB noted that there was no new information on this subject and that the project is now considered to be concluded.

c) **Print Pages at the Secretariat**

STACPUB noted that a lot has been accomplished in regard to avoiding double printing of documents, as no second print is now made for the majority of SCR and SCS Documents. As *participants at the meetings are requested to submit finalized documents, and participants no longer* get another copy by mail, there has been further decreases in the costs connected with publications.

4. **Promotion and Distribution of Scientific Publications**

a) **Publicity and Response Regarding the Journal**

The inclusion of the Journal in Allen Press Subscription Catalog has been suspended due to costs involved and because it has been difficult to evaluate its effectiveness. STACPUB was informed that the Journal is included in a number of relevant scientific citation indices.

STACPUB found that topics of broad interests considered at NAFO Special Sessions and published in the Journal, could be a possible avenue to enhance the propagation of the Journal.

b) **Invitational Papers for the Journal**

As requested the Secretariat had contacted V. K. Zilanov (Russian Federation) about the prospects for a possible submission of scientific papers from various Russian research institutes. The response from V. K. Zilanov had been very positive, but as of this meeting there had been no further progress.

As a result of the forthcoming Russian/German Data Evaluation Project on historic ICNAF/NAFO oceanographic data, STACPUB welcomed an invitational paper on results of this bilateral project. This paper would be available after the completion of the 3-year project starting during 1995 when funds are allocated.

STACPUB agreed that further invitational papers should be considered by STACPUB members, and proposals be brought to the September 1994 Meeting.

5. **Editorial Matters Regarding Scientific Publications**

a) **Editorial Activities**

At its meetings since 1980, STACPUB had nominated a total of 448 research documents as potential for publication in the NAFO Journal or Studies. This included 12 documents nominated at the June 1993 Meeting and 25 documents at the September 1993 Meeting. Since 1980, a total of 357 papers have been published in the Journal (166) and Studies (191). Some of the papers have been submitted independent of the research documents series.

b) **Progress Report of Publication on West Greenland Cod**

Papers for the single issue publication on West Greenland cod is being compiled by the coordinator (H. Lassen). Three to four papers have progressed considerably, while others have not been received. A very early submission has already been published in the Journal, and hence it was necessary for the plan to have all papers in one single issue to be amended somewhat.

c) **Review of General Editorial Process**

STACPUB noted that the general editorial process had improved and seemed to run smoothly.

d) **Review of the Editorial Board**

STACPUB welcomed S. Murawski (USA) as the newly appointed Associate Editor for Vertebrate Biology in replacement of R. G. Halliday, who stepped down from the Editorial Board in September 1993.

6. **Papers for Possible Publication**

a) **Procedures for STACPUB Review**

A detailed discussion was carried out regarding the procedures for STACPUB review of papers. It was agreed that the questionnaire requesting authors to state whether or not a paper should be considered for publication was an improvement and had considerably lowered the workload of STACPUB. The inclusion of boxes to indicate whether a paper should be considered for Journal or Studies was also found useful.

Concern had been raised that papers passing STACPUB review had often been heavily criticised by Associate Editors and referees and that a number had been rejected for publication. This often leading to an extensive workload for editors and referees and disappointment for the authors.

STACPUB found that time constraints at the meetings could be a limitation to a fair review of papers, but on the other hand agreed that the role of STACPUB was to act as a preliminary review board with the opportunity to encourage authors to upgrade papers and offer constructive comments. The sole responsibility for the quality of the paper however lies with the author. It was agreed that in the letter to the author it should be clearly stated that a nomination does not necessarily mean approval for publication.

STACPUB noted that some authors do not differentiate between Journal and Studies and stressed that authors need to put more effort into evaluation of the content of the paper and the distinction between Journal and Studies.

b) **Review of Proposals Resulting from the 1993 Meetings**

Of the 12 papers nominated at the June 1993 Meeting, 7 papers have been submitted. In addition, of the 25 papers presented at the NAFO 1993 Special Session, 12 papers have been submitted and are in various stages of preparation for a single issue of the Journal.

In addition, 5 papers from outside of the STACPUB nomination process were submitted since June 1993.

c) **Review of Contributions to the 1994 Meetings**

STACPUB was pleased with the inclusion in the questionnaire to authors of SCR Documents, boxes to indicate the preferred publication (i.e. either the Journal or Studies). As a result, STACPUB members were able to focus on those papers requested by the authors. Members were also able to offer comments as to how each document could be improved.

STACPUB considered 16 SCR Documents and nominated the following 13 including the standard papers on overview of environmental conditions: SCR Doc. 94/4, 7, 18, 19, 20, 24, 26, 27, 28, 30, 33, 35 and 58. The Assistant Executive Secretary was requested to invite the authors to submit them in a suitable form for consideration for publications, with a clear note as discussed above in Section 6.a).

7. **Publication of 10-year Environmental Perspective**

STACPUB suggested this to be discussed with the conveners at the September 1994 Symposium on environmental conditions.

8. **Other Matters**

No other matters were discussed.

9. **Acknowledgement**

The Chairman closed the meeting and thanked the members for their contributions. He also thanked the Assistant Executive Secretary for his support and organization of most of the documentation for review and asked that he convey the Committee's appreciation to the staff of the Secretariat for their efforts in support of the NAFO publications.

A special thanks was afforded to K. H. Nygaard for his assistance as rapporteur while making a full contribution to the meeting as a member.

PART C

Scientific Council Annual Meeting, 9-23 September 1994

CONTENTS

REPORT OF SCIENTIFIC COUNCIL

Annual Meeting, 19-23 September 1994

Chairman: H. Lassen Rapporteur: T. Amaratunga

I. PLENARY SESSIONS

The Scientific Council met at the Holiday Inn, Dartmouth, Nova Scotia, Canada during 19-23 September 1994. Representatives attended from Canada, Denmark (in respect of Faroe Islands and Greenland), Estonia, European Union (Denmark, France, Germany, Portugal, Spain and United Kingdom), Iceland, Japan, Republic of Korea and Russian Federation, and an observer from FAO, of the United Nations. The Executive Secretary and Assistant Executive Secretary were in attendance.

The opening session of the Council was called to order at 1025 hr on 19 September 1994.

The Chairman welcomed everyone to this 16th Annual Meeting. The Assistant Executive Secretary was appointed rapporteur. The Council welcomed R. Grainger the CWP Secretary, extending its invitation to the FAO representative as an observer to this meeting.

In considering the provisional agenda, the Chairman noted that the Council had by unanimous consent agreed to include the Denmark/Greenland request for advice on Greenland halibut in Div. 0B and 1BCDEF. This was accordingly included in the agenda as Item II.2.d (see Agenda III, Part E, this volume). There being no further changes considered, the Council **adopted** the agenda.

Noting that the STACFIS stock assessments were needed for presentation at the Fisheries Commission Meeting on 20 September, the session was adjourned at 1040 hr on 19 September 1994.

The Council reconvened at 1620 hr to address some requests from the Fisheries Commission that were still outstanding from the June 1994 Meeting. Discussions pertaining to the update on the 1995 Symposium, the status of the Russian experimental fishing for redfish with different mesh sizes and the Faroese experimental fishery on shrimp in the Flemish Cap and in a part of Div. 3L, are reported below under relevant agenda headings.

The session was adjourned at 1730 hr.

The Council reconvened briefly through 20-22 September 1994 particulary to address requests from the concurrent Fisheries Commission sessions and discuss various items in the agenda. These are reported in relevant sections below.

The concluding session was called to order at 0900 on 23 September 1994. The Council then considered and **adopted** the Report of the Standing Committee on Fishery Science (STACFIS), the Report of the Standing Committee on Research Coordination (STACREC), and the Report of the Standing Committee on Publications (STACPUB) and **adopted** the Scientific Council Report of this meeting.

The meeting was adjourned at 1115 hr.

The reports of the Standing Committees are appended as follows: Appendix 1 - Report of the Standing Committee on Fishery Science (STACFIS), Appendix II - Report of Standing Committee on Research Coordination (STACREC), Appendix III - Report of Standing Committee on Publications (STACPUB).

Brief summaries of the Standing Committee Reports and other matters considered by the Scientific Council are given below in Sections II-XII. The Agenda, List of Research (SCR) and Summary (SCS) Documents, and the List of Participants of this meeting are given in Part E, this volume.

II. FISHERY SCIENCE (see STACFIS report, App. I)

1. Review of 1994 Recommendations

There was no review of recommendations from the June 1994 Meeting done by STACFIS.

2. Stock Assessments

a) Shrimp in Division 3M

The Council noted that available information on shrimp in Div. 3M was reviewed by STACFIS and reported in detail in the STACFIS report. The following was prepared in response to the request for advice from the Fisheries Commission.

The present fishery for shrimp in Div. 3M raises questions related both to the management of the shrimp resource and regulation of redfish by-catch.

i) Status of Shrimp Resource

The Council considered information from the commercial fishery and research surveys to determine the status of the northern shrimp resource on Flemish Cap (Div. 3M). No significant commercial effort was reported from the area before spring 1993 but, since then, a multinational fishery has developed with removals of shrimp in the order of 28 000 tons in 1993 and 20 000 tons up to the end of August, 1994.

Fishery information from Canada and Denmark/Greenland indicated that the distribution of effort in 1994 differed from that observed in 1993 in that more fishing activity occurred in the western and southwestern areas of the Flemish Cap. The Denmark/Greenland data showed that fishing was unproductive in eastern areas and that catch rates were maintained by concentrating effort in areas where densities were highest. The Canadian fishery in March, 1994 produced low catch rates over the preferred grounds fished in 1993. Data from some nations showed that catch rates were substantially lower in 1994 and there was no distinct decline in CPUE over the year, as observed in 1993.

Commercial catch sampling data showed changes in the size/age composition of the catches between the two years. Males were much more prevalent in the catches of several nations in 1994, compared to a clear domination by female ages in 1993. The component of females present in 1994 is believed to be the remains of the strong 1988 year-class which cannot be expected to contribute substantially to the catches much longer.

The EEC/EU groundfish surveys from 1988 to 1994 showed that biomass in 1994 was substantially lower than observed during the 1991 to 1993 period, approaching the levels estimated for 1988 to 1990. The data further showed that decreases were widespread, occurring throughout the survey area in all strata. The proportions of biomass estimated in western and southwestern strata in 1994 were higher than in the previous two years, consistent with the change in the distribution of fishing effort by the commercial fleet. Size/age composition data, over time, revealed the growth and maturation of the strong 1988 year-class.

The Council agreed that shrimp abundance decreased in 1994 and that changes observed in biomass, CPUE, distribution of effort and size composition of the catches were a reflection of the intensive fishery (about 50 000 tons) over a 16-month period. The data suggested that the 1988 year-class has been substantially reduced through natural and fishing mortality and that catches in 1995 will be dependent upon younger, male year-classes. None of these year-classes appear to be as strong as the 1988 year-class.

It is still unclear whether or not a sustainable shrimp fishery is possible on Flemish Cap. If the high abundance of the early-1990s was due almost entirely to one strong year-class, and if occurrences of such year-classes are sporadic, then the concept of sustainability does not apply. Harvesting the 1988 year-class at lower removals over several years (1991-94), with the addition of some annual recruitment, might have been possible. However, this opportunity to test the concept of a sustainable fishery has been lost. Clearly, any fishery cannot be maintained at current effort levels and a reduced annual effort is required to afford some protection for younger animals at lower stock size.

ii) **By-catch of redfish**

In 1993, the Council considered the by-catch of small redfish taken in the shrimp fishery on Flemish Cap as a potential for significantly impacting the redfish resource in the area and recommended that sorting grates be mandatory in shrimp fishing operations as a means of minimizing the by-catch of redfish and other fish species. Data from the 1994 fishery show that redfish by-catch remained a problem, despite the use of sorting grates. Bar spacings of 28 mm were not effective in eliminating by-catch of redfish in the 14-20 cm size range (ages 2-5). Although it is not possible to quantify the actual removal of redfish as by-catch, it is certain that for 50 000 tons of shrimp taken since May, 1993, several thousand tons of redfish also have been taken. The redfish by-catch will adversely affect the catch possibilities for commercial redfish fisheries 5-6 years hence. A minimal, annual by-catch of 3 000 tons at sizes encountered in 1993 corresponds to approximately 100 000 fish. If projected, these would correspond to lost future catch opportunities of more than 10 000 tons.

By-catch of redfish will continue to be a problem in 1995. Grates with 28 mm bar spacings eliminate virtually all by-catch of redfish >21 cm. The Council **recommended** that *the mandatory use of grates in shrimp fishing activities on Flemish Cap be continued but that a bar spacing of less than 28 mm be enforced.* The appropriate spacing is unknown at present but experiments conducted in 1994 showed that 19 mm spacings significantly reduced the redfish by-catch in Div. 3M. However, the effect of such a spacing on the shrimp catch rates and size composition could not be determined.

b) **Capelin in Divisions 3N and 3O**

Preliminary data from the Russian acoustic survey on capelin in Div. 3NO during 14-24 July 1994 were available. Few capelin were seen, however, the survey results were difficult to interpret because the timing of the survey did not coincide with the presence of mature capelin on the Southeast Shoal spawning area. Consequently, the Council had no basis to change its previous advice (of June 1994) that no capelin fishing be allowed in Div. 3NO during 1995.

c) **Data Availability for Assessment of Northern Shrimp in November 1994**

The Council noted that data would be available for consideration by STACFIS at the 18-21 November 1994 meeting of the Scientific Council. The Council noted the change in dates of this meeting (originally announced as 17-20 November 1994).

d) **Greenland Halibut Fishery with Longline *vs* Trawl in Div. 0B and 1BCDEF**

The Council received from Denmark (Greenland) on 22 July 1994 (after the provisional agenda was circulated) a request for additional scientific advice on management of Greenland halibut (see Attachment 4 to Agenda) on options corresponding to different ratios between longlining and trawling. Further to STACFIS discussion on this matter the Council submitted the following response.

The Scientific Council noted that the precision in the current advice did not allow for an attribution of a catch level to specific gears, as stock composition at age was unknown, and as the relative fishing power of the gears needed to be quantified. It was also noted, that the current fishing mortality was thought to be high, and thus the difference in yield-per-recruit for longline and trawl was considered to be small. It was further noted that the yield-per-recruit analysis was very sensitive to slight changes in the parameters. Thus the gear comparison should be treated with caution.

3. **Fisheries Commission Requests**

The following responses, to requests for advice and information received by the Council from the Fisheries Commission, were submitted to the Fisheries Commission during the course of this meeting. It was noted that some of these responses may have been issued directly as FC documents as well.

a) **Minimum Landing Sizes for Greenland Halibut and Flatfishes**

A request regarding minimum landing sizes for Greenland halibut and flatfishes (see Agenda III, Attachment 1, Part E, this volume) had been forwarded to the Council for consideration in June 1994.

No data pertinent to this question were made available to either the June 1994 or to the September 1994 sessions of the Scientific Council, even though it was previously indicated that such data would be available.

The Council recognized that the data required would be from selectivity studies with mesh sizes in current use, supplemented with biological data on length of first maturity and growth.

It was established that no selectivity data were available in Canadian and EU laboratories. Some preliminary information was received from Norway during this meeting. It was not possible to clarify the status of data in Russian laboratories. It was agreed that the Secretariat should inquire from the laboratories of Contracting Parties on the availability of mesh selection data appropriate to evaluate minimum landing size for Greenland halibut and witch flounder. Results of this inquiry should be reported to the June 1995 Scientific Council Meeting.

b) ***Flemish Cap Cod (Division 3M)***

Further to the scientific advice on cod in Div. 3M provided by the Council in June 1994, the Fisheries Commission requested further clarifications. The Council in response submitted the following note.

Survivors of the good 1990 and 1991 year-classes could begin to contribute to the spawning stock in 1995 and continue to contribute for the subsequent 4 to 5 years. However, both of these year-classes recruited to the fishery at age 2, and data from EU surveys indicate that both experienced high levels of exploitation in 1993 and 1994. Since fish are recruited to the fishery at such a young age (2-3 years old), at the present high levels of fishing mortality, only a small proportion of these year-classes will survive to contribute to the spawning stock. Hence in order to allow the spawning stock to rebuild, a much reduced level of fishing mortality on young fish, is necessary.

Although there is no direct relationship between spawning stock and recruitment for the Flemish Cap cod, an increase in spawning stock biomass will not only increase the probability of good recruitment, but will also result in an increase in the proportion of larger fish in a larger exploitable biomass that should allow a more stable fishery.

c) **Research Requirements for Greenland Halibut**

In response to a request of the Fisheries Commission during this meeting, the Council reviewed the research requirements considered necessary to significantly enhance knowledge on the biology and assessment of Greenland halibut in Subareas 2 and 3.

The major requirements were:

i) Survey coverage of the total stock area to depths of at least 1 500 m.

ii) Data from the commercial fisheries, including biological data.

At present, part of the distribution area was being surveyed but coverage of deep strata had not been carried out except on an occasional basis. It was recognized that some of the vessels currently used for surveys did not have the capacity to carry out surveys in deeper waters. Therefore, vessels with the necessary capability to fish deep water would be required as a complement.

In reviewing the current survey activity in comparison to the major requirements, the Council noted that:

i) There has been no recent stratified-random bottom trawl survey in Div. 2G and 2H.

ii) The annual Canadian groundfish surveys conducted in autumn in Div. 2J+3K and Div. 3LNO extends only to depths of 1 000 m and 730 m, respectively.

iii) A Canadian Greenland halibut directed deep water fixed station survey was conducted in August/September 1991 in Div. 3KLM. A second survey was conducted in February/March 1994 extending to Div. 3N, using a stratified-random design. If such a survey is repeated, it should use the same design, gear and the same or similar vessel as used in 1994. In addition, the survey should be expanded to cover additional area in Div. 3NO to where the commercial fishery has also expanded in recent years.

iv) The annual groundfish survey conducted by the EU in Div. 3M during summer (mainly July) does not extend below 750 m, nor does it include the area of the Flemish Pass.

v) The EU proposed Greenland halibut survey in the NAFO Regulatory Area using longlines to depths of 2 000-2 500 m should be carried out in autumn 1995 in conjunction with, and as a complement to, the Canadian groundfish surveys.

vi) There is a need to expand sampling of the commercial fishery for biological data such as length, sex, maturity and age, especially from deepwater fixed gear fisheries in Canada's far north where current sampling is very limited.

vii) For the purpose of examining migratory patterns especially in the deepwater of Div. 3LMNO, tagging studies should be conducted. As a first initiative, this should be conducted in part during the proposed EU longline survey, since longline gear offers an increased chance of survival from tagging.

viii) In response to continued requests from the Fisheries Commission regarding minimum landing size for Greenland halibut, gear selectivity studies using current regulated mesh size would be informative.

In addition to the above proposals, it would be advisable to continue the trawl surveys in Subarea 1, being the longest continuous survey time series on the stock in recent years, and further expand this survey or to supplement this with surveys in Div. 0B offshore so as to cover the offshore distribution area.

Besides a thorough collection of biological data including length, sex, maturity, fecundity, diet etc. from the above proposed surveys and expanded surveys, a complete set of appropriate environmental observations should be collected.

d) **Information on the Food Fishery for Cod in Newfoundland and Labrador**

In response to the Fisheries Commission request of 20 September 1994, for information on the Canadian food fishery for cod in Newfoundland and Labrador area, the Council submitted the following information.

In 1994, the Minister of Fisheries and Oceans allowed a subsistence food fishery to take place for cod in the waters around Newfoundland and Labrador. This fishery took place over a 4 week period but was open only 2 days a week. Thus the fishery occurred over a period of only 8 days. Participants were restricted to the use of hand lines/baited hook, jiggers or sport fishing gear (rod and reel) only. A limit of 10 fish per day per individual was imposed, with the requirement that all groundfish caught regardless of species or size must be retained and counted against the 10 fish limit.

Preliminary estimates suggested that during the 8 days of this fishery, the total cod catch was in the range of 700-750 tons. This catch was spread amongst 3 different cod stocks, one of them being Div. 2J and 3KL (northern) cod. At present there is no information concerning the proportion of the estimated catch taken from this one stock.

e) **Concerning Redfish By-catch in the Shrimp Fishery in Div. 3M**

In response to the request from the Fisheries Commission during this meeting concerning further detailed information on the loss of yield of Div. 3M redfish as a result of by-catches of pre-recruit fish in the shrimp fishery, the following calculations were carried out.

Yield-per-recruit analysis is a tool used in fishery science to obtain estimates of the yield weight which might be expected from a recruiting fish under different reference levels of fishing mortality. The reference levels usually discussed at the Scientific Council are $F_{0.1}$ and F_{max}. In 1989, Scientific Council had available information (NAFO Sci. Coun. Rep., 1989, p 69) concerning yield-per-recruit for redfish in Div. 3LN, and it was agreed at that time that the values were reasonably appropriate for application to redfish in Div. 3M. These data give the following results:

Natural Mortality Rate: 0.1 per year
$F_{0.1}$ computed as 0.1216 per year at Y/R of 0.1543 kg
F_{MAX} computed as 0.2196 per year at Y/R of 0.1653 kg

The following tables summarize the yield losses under different scenarios concerning shrimp catches and by-catch levels based on the above yield-per-recruit analysis. All losses would be spread out over about 15 years, but these losses would in an equilibrium situation represent annual losses. The expected accumulated yield of a year-class over its entire lifespan in the fishery is approximately 20 000 tons. The accumulated losses should be compared with this yield. Losses in excess of 20 000 tons would only be realized for strong redfish year-classes.

By-catch of 1%

Shrimp catch (tons)	By-catch ($\times 10^6$)	Yield loss (tons) $F_{0.1}$	Yield loss (tons) F_{max}
30 000	10	1 540	1 650
10 000	3.3	510	550
5 000	1.7	260	280
3 000	1	154	165

By-catch of 3%

Shrimp catch (tons)	By-catch ($\times 10^6$)	Yield loss (tons) $F_{0.1}$	Yield loss (tons) F_{max}
30 000	30	4 620	5 000
10 000	10	1 540	1 650
5 000	5	780	840
3 000	3	460	500

By-catch of 5%

Shrimp catch (tons)	By-catch ($\times 10^6$)	Yield loss (tons) $F_{0.1}$	Yield loss (tons) F_{max}
30 000	50	7 700	8 250
10 000	17	2 550	2 750
5 000	9	1 300	1 400
3 000	5	770	825
1 000	2	230	250

By-catch of 10%

Shrimp catch (tons)	By-catch ($\times 10^6$)	Yield loss (tons) $F_{0.1}$	Yield loss (tons) F_{max}
30 000	100	15 400	16 500
10 000	33	5 100	5 500
5 000	17	2 600	2 800
3 000	10	1 540	1 650
1 000	3	460	500

By-catch of 20%

Shrimp catch (tons)	By-catch ($\times 10^6$)	Yield loss (tons) $F_{0.1}$	Yield loss (tons) F_{max}
30 000	200	30 800	33 000
10 000	66	10 200	11 000
5 000	33	5 200	5 600
3 000	20	3 080	3 300
1 000	6	920	1 000

f) Concerning the Nature of Papers Expected for the 1995 Symposium on Seals

In response to the Fisheries Commission request on the nature and extent of analyses that are expected to be tabled at the 1995 Symposium with respect to the interrelation between seals and commercial fish stocks, the Council noted that although many researchers throughout the world had expressed interest in participating, it was premature to predict the papers.

The full text of the response is given below in Section X.1.

4. Arrangements for Conducting Stock Assessments and Proposed Future Documentation

a) Working Procedures for the June 1995 Meeting

The Council noted the useful discussions by STACFIS regarding the procedures, and agreed further discussions would assist the Committee in completing its work effectively.

b) Updating List of Designated Experts

The Council noted the proposed changes in the Designated Experts, and encouraged early contact with the experts, and to provide them with necessary data for their assessment work.

c) Guidelines for Designated Experts

The Council noted the guidelines being proposed by STACFIS for the Designated Experts. However, with the changes to the work of the Scientific Council and STACFIS, these may need to be reviewed during the June 1995 Meeting.

d) Status of Scientific Documents

The Council observed that STACFIS had agreed on some minor amendments to past practice. The Scientific Council would review this topic further during the June 1995 Meeting.

e) Guidelines for Documentation of Assessments

The Scientific Council noted the decisions made by STACFIS and agreed to discuss these further during the June 1995 Meeting.

5. Future Special Sessions

a) Report of the 1994 Special Session

The Council endorsed the appreciation extended to the conveners for their preparatory work and convening the Special Session. The Council endorsed the recommendation on a long-term monitoring of oceanographic properties within the NAFO area.

It was noted that the Special Sessions planned for 1995 and 1996 were discussed by the Council (see Section X. below). The Council also noted the STACFIS discussion on the tentative topics for the 1997 Special Session.

6. **Other Matters**

a) **Silver Hake Ageing Methodology Report**

The Council was pleased with the progress made with respect to preparing a manual on silver hake ageing methodology, and encouraged the completion of the report by June 1995.

III. RESEARCH COORDINATION (see STACREC report, App. II)

1. **Acquisition of STATLANT 21 Data and Publication of Statistical Information**

The Council agreed with STACREC that the *NAFO Statistical Bulletin* Vol. 41 containing the 1991 data should be published in the absence of data from EU-France. It was noted that Volumes 39 and 40 were also published without data components from EU-France. The Council reiterated the importance of obtaining STATLANT data from all Contracting Parties for the publication of the Bulletins.

2. **Report of CWP *Ad Hoc* Consultation of 11-15 July 1994**

The Council accepted the STACREC review of the Report of the CWP Consultation held during 11-15 July 1994 in Madrid, Spain. The subsequent submission to the General Council regarding the Statutes and Rules of Procedure for the CWP was addressed by Scientific Council under agenda item on Structure of CWP (see Section VIII.2 below).

3. **Non-traditional Fishery Resources in the NAFO Area**

The Council agreed with the STACREC view that with the decline in the fishery for most of the traditional species, information concerning distribution and abundance of species such as skates and wolffish were becoming more important. The Council endorsed the **recommendation** that *efforts be made to analyze research survey databases held by Contracting parties, and present the results of these analyses during the June 1995 Meeting.*

4. **Data from the Pilot Observer Program**

The Council agreed that the accessibility to the data collected by the various Contracting Party Pilot Observer Programs should be investigated, and if the data are accessible, they should be made available by the representatives to the Designated Experts prior to June 1995.

5. **Updating Conversion Factors**

The Council noted the steps undertaken by FAO to update the conversion factors, and was thankful to R. Grainger, CWP Secretary, for his efforts on this matter.

6. **Research Coordination for Greenland Halibut**

The Council was pleased with STACREC initiatives in coordinating research among Contracting Parties on Greenland halibut. It was noted that in response to a Fisheries Commission request during this meeting, the Council submitted a proposal on research survey requirements for Greenland halibut which was reported in Section II.3.c. above.

7. **Review of Research Documents**

The Council noted nine Research Documents which were not relevant to stock assessments and not considered by STACFIS, were reviewed and reported by STACREC.

IV. PUBLICATIONS (see STACPUB report, App. III)

1. Review of Scientific Publications

The Council was pleased with the substantial progress made since the June 1994 meeting, in the review of papers, and the publication of both the Journal and Studies issues.

Noting the delay in the review process of papers presented at the 1993 Symposium, the Council endorsed the **recommendation** to request an update from the conveners (editors).

2. Promotion and Distribution of Scientific Publications

The Council was pleased an attempt would be made to compile an overview paper on the historic oceanographic work carried out on the Flemish Cap.

3. Review of Papers for Possible Publication

The Council appreciated the considerable difficulty experienced by STACPUB to find an appropriate vehicle to publish the papers from the 1994 Symposium. Since the quality of papers submitted at most Special Sessions are likely to vary substantially, the Council endorsed the **recommendation** that *a discussion be initiated during the June 1995 Meeting to consider a publication series for Symposium contributions.*

The Council was pleased to note that scientists working on shrimp on the Flemish Cap will be approached to solicit papers for a special publication on the subject.

V. EXPERIMENTAL FISHERIES

1. Faroese Experimental Shrimp Fishery in Divisions 3LN

In respect of the Faroese experimental shrimp fishery in a part of Div. 3L, the Scientific Council noted that it had not received a research plan for prior comments for this program. Since shrimp fishing in Div. 3L was banned in 1994, the Scientific Council found it particularly unfortunate that this had not happened, but recognized the short time available for planning these cruises. The Scientific Council encouraged that future research programs of this nature be discussed prior to their implementation.

The Council was informed the experimental fishery was in Div. 3L and did not include Div. 3N. The Council reviewed SCR Doc. 94/75, 76, 77, 78 and 79 on this subject.

In the period 1 January-30 June 1994, two Faroese shrimp vessels conducted exploratory fishing in Div. 3L on the Nose of the Bank. Two observers were onboard gathering biological data including by-catches especially in relation to sorting grates. The scientific design of the investigation was described in SCR Doc. 94/75.

In limited areas the experimental fishing found catch rates comparable to those experienced in Flemish Cap. The spatial coverage of the survey was limited, and no assessment of the occurrence over the Bank and its slopes could be made.

By-catches included cod and redfish. Cod by-catch, given their length distribution, were probably a result of the grate not functioning. Compared with Div. 3M, it appeared that the by-catch of redfish was lower.

Age, growth and reproduction was analyzed and was compared with Div. 3M. It was noted there may be growth differences between shrimp on the Bank and on the Flemish Cap.

2. **Russian Experimental Fishing for Redfish with Different Mesh Sizes**

The Russian representative informed the Council that the program was underway, the cruise was ongoing and data would be available late-1994 or early-1995. The Russian representative agreed that these data and analyses in the form of an SCR Document would be forwarded to the Secretariat as soon as possible, for an early distribution prior to consideration at the June 1995 Meeting.

VI. RULES OF PROCEDURE

The Council noted that it had adopted changes in its Rules of Procedure, particularly Rule 5, in June 1994. The Council at that time allowed the time between the June and the September meeting for further considerations. However, there were no comments received, and noted that the Rules will come into force on 1 January 1995.

VII. STRUCTURE OF SCIENTIFIC COUNCIL AND DOCUMENTATION

1. **Adoption of Work Procedures for June 1995 Scientific Council Meeting**

The Council noted that during the June 1995 Meeting there will be a new element as a result of an overlap of 3 days at the beginning of the Scientific Council (7-21 June) with the Joint ICES/NAFO Working Group on Harp and Hooded Seals (5-9 June). It was recognized that time must be provided on 9 June for the Council to review the assessments of this Working Group. It was also considered that this timing should not be in conflict with the schedule of STACFEN.

The Scientific Council tentatively scheduled the meeting as follows, however, it was noted that the Chairmen would discuss this schedule in advance of June 1995:

a) 5-9 June - Working Group on Harp and Hooded Seals.

b) 7 June - Opening of Scientific Council followed by STACFIS (see STACFIS report, App. I, item IV.1.).

c) 8 June - STACFEN

d) 9 June - Scientific Council: discussion of advice for Harp and Hooded Seals in the Northwest Atlantic, and STACFEN if needed.

e) 10-11 June - No committee meetings. Completion of preliminary assessments.

f) 12-13 June - STACFIS: review of assessments.

g) 14 June - STACREC and STACFEN.

h) 15-16 June - STACFIS: review of assessments and completion of agenda.

i) 17-21 June - Scientific Council: formulation of advice.

The Council agreed that the Executive Committee will discuss this plan further, prior to formulating the provisional agenda in early-April, 1995. The Council further took note of the discussion on time constraints (see Other Business below) and it was pointed out that the Chairmen of the Scientific Council and its Committees could take a critical look at the agendas. There could be items which could be deleted from either the Annual or the June meeting, i.e. certain items to be discussed only once a year.

2. **Space Requirements for June Meeting**

The Council was pleased to learn that similar space to June 1994 will be provided for the June 1995 Meeting.

3. **Hardware and Software Requirements for June Meeting**

The Council recalled its comments from the June 1994 Meeting, and emphasized the need for improved computer printing facilities and, for software, the availability of a spreadsheet program on the computers e.g.

LOTUS 1-2-3/QUATTRO/EXCEL. It was also recognized that there may be a need for special computer equipment for presentations. Members also mentioned various other software which may be useful. It was agreed that information should be forwarded to the Secretariat for circulation among Scientific Council members.

4. Documentation and Publications of the Scientific Council

The Council took note of the discussion by STACFIS and recognized the need to continue discussions on this point to make the best use of the time available for the meeting as well as the Secretariat.

VIII. COLLABORATION WITH OTHER ORGANIZATIONS

1. Joint ICES/NAFO Working Group on Harp and Hooded Seals

The Scientific Council on 17 June 1994 received a request for advice on harp and hooded seals. At its June 1994 Meeting, it was agreed a meeting of the Working Group prior to its June 1995 Meeting would provide an opportunity for the Council to review the Wórking Group report and develop advice to the Fisheries Commission. The Council at its meeting in June 1994 agreed to defer discussion on Terms of Reference for the Joint ICES/NAFO Working Group on Harp and Hoods Seals to address the request. After consultations with the incoming Chairman of the Working Group and ICES, the Council agreed the following Terms of Reference would be forwarded to ICES to call a meeting of the Working Group.

The proposed Terms of Reference for this Working Group are as follows:

The joint ICES/NAFO Working Group on Harp and Hooded Seals shall meet 5-9 June 1995 at NAFO Headquarters, Dartmouth, Nova Scotia, Canada, with G. Stenson, St. John's, Newfoundland, Canada, as Chairman to:

- Assess stock sizes, distributions and pup production of harp and hooded seals in the Northwest Atlantic and estimate replacement and sustainable yields both at present stock sizes and in the long term under varying options of age compositions in the catch.
- Assess the effects on harp and hooded seal populations of recent environmental changes or changes in food supply and possible interactions with other living marine resources in the North Atlantic.
- Provide proposals for future research programs.

Based on the report of the above-mentioned meeting, the Scientific Council will then at its June 1995 Meeting:

- Advise on catch options for harp and hooded seals in the NAFO area.

2. Review of Structure of CWP

The Council noted that STACREC reviewed the proposed Statutes for CWP as contained in the Report of the CWP *Ad hoc* Consultation in Madrid, 11-15 July 1994, and suggested minor changes as contained in NAFO SCS Doc. 94/20.

The Scientific Council reviewed the proposed amendments to the Statutes for the CWP as proposed by STACREC, and forwarded them to the General Council for approval.

IX. REVIEW OF FUTURE MEETING ARRANGEMENTS

1. Scientific Council Meeting on Northern Shrimp, November 1994

The Council agreed to change scheduled dates from the original 17-20 November to 18-21 November 1994. The meeting will be held at NAFO Headquarters, Dartmouth, Nova Scotia, Canada.

2. **June 1995 Meeting of Scientific Council**

The dates previously agreed of 7-21 June 1995 were confirmed by the Council. The meeting will be held in Dartmouth, Nova Scotia, Canada. The meeting will be preceded and partly overlapped by the meeting of the ICES/NAFO Working Group on Harp and Hooded Seals during 5-9 June 1995, which will also be held at the same place as the Council Meeting.

3. **Special Session and Annual Meeting, September 1995**

The Council noted the dates for the Annual Meeting 11-15 September 1995 which would be preceded by a Special Session symposium on 'The Role of Marine Mammals in the Ecosystem' during 6-8 September 1995.

4. **June 1996 Meeting of the Scientific Council**

The Council set 5-19 June 1996 as tentative dates for the meeting.

X. FUTURE SPECIAL SESSIONS

1. **Update on Special Session of September 1995**

The Scientific Council of NAFO and the International Council of the Exploration of the Sea (ICES) have agreed to sponsor a Symposium on the 'Role of Marine Mammals in the Ecosystem', co-convened by J. Sigurjonsson (Iceland) and G. B. Stenson (Canada). It is intended that papers presented at this Symposium will address a number of issues including ecological processes affecting marine mammals, foraging strategies, energetic considerations, marine mammal-fisheries interactions, multispecies models and future research requirements. Relevant papers dealing with any marine mammal population will be accepted, although studies related to issues in the North Atlantic will be given preference if time is limited.

The Council noted a first announcement had been distributed by both NAFO and ICES, alerting potential participants to the intentions. Speakers will be invited to present keynote addresses for each session, and a second announcement and call letter for contributed papers will be issued by 1 December 1994. Abstracts describing proposed papers will be due 1 March 1995.

As the first announcement had only recently been distributed and the final deadline for papers was not until next March, the convenors could not at this time determine the nature of the papers which will be presented on interrelationships between seals and commercial fish stocks. The convenors were aware of a number of studies addressing the topic and were encouraging the researchers to present their findings. A number of researchers from throughout the world had already expressed interest in participating in the Symposium (e.g. Australia, Canada, Denmark, Norway, Philippines, South Africa, United Kingdom and United States of America), but had not provided information on the papers they intend to present. The convenors will have a better understanding of the nature and extent of analyses that will be presented once abstracts are submitted next spring.

2. **Special Session of September 1996**

The Council noted that there had been no progress made since the June 1994 Meeting to develop on the proposed topic "What future for Capture fisheries", and hoped that this would be possible before the June 1995 Meeting.

XI. OTHER BUSINESS

1. **Annual (September) Meeting**

The Council discussed the time constraints it faces during the Annual meetings and recognized that there were significant problems in running an effective Scientific Council Meeting parallel to meetings of the Fisheries Commission.

It was further noted that assessment of the Flemish Cap Shrimp during this meeting was rushed and that there had been little time to adequately draw conclusions.

The Council discussed several ideas. These included

- The Scientific Council September Meeting would start on Friday or Saturday of the week before the Annual meeting. Then, while the General Council and Fisheries Commission are in session, the Scientific Council would only deal with requests from those bodies.

- How the requests should be answered was discussed, and it was questioned whether it would be necessary or desirable that these be answered by the entire Scientific Council or be answered by the Chairman and /or the Executive Committee of the Council.

No conclusions were drawn at this point in time.

The Council recalled its discussions on how the June Meeting should be organized. Since they have implications on the workload at the Annual Meeting, the Council agreed that it would need yet another look at the total arrangements. In this connection the Council recalled its decision that the Chairmen should critically review their agendas and consider if most topics could not be completed during the June meeting when most participants are present.

XII. ADOPTION OF REPORTS

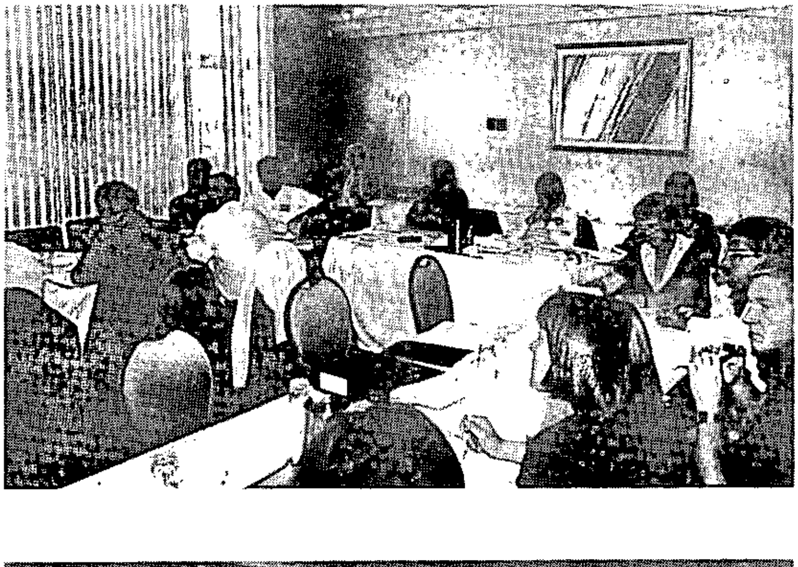
At its concluding session on 23 September, the Council **adopted** the reports of STACFIS, STACPUB and STACREC.

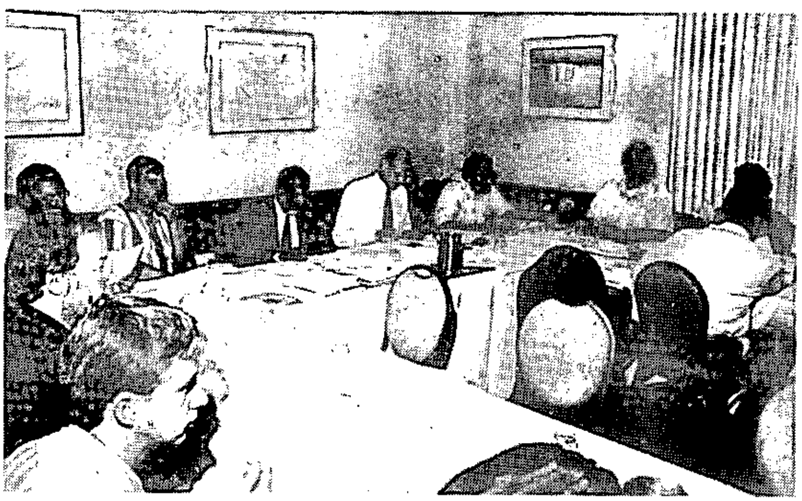
The Chairman then proposed that the Council Report as discussed be adopted, noting that some text change would be made by the Chairman and the Assistant Executive Secretary. The Council accordingly **adopted** the report of this meeting.

XIII. ADJOURNMENT

In closing the meeting the Scientific Council thanked the outgoing Chairman of STACFIS H.-P. Cornus (EU-Germany) for a job very well done. His term of office had been at a time of considerable scientific problems with the new fisheries on the Flemish Cap and in the Flemish Pass. Even so H.-P. Cornus had time to also critically review the working procedures of his Committee and had with success introduced several changes. The Chairman also welcomed the incoming Chairman of STACFIS W. B. Brodie (Canada) and looked forward to a period with friendly, open and fruitful cooperation. The Chairman thanked all participants for their contributions and for helping him in running the meeting and wished them a safe journey home. Furthermore he thanked the Assistant Executive Secretary for all his help and asked him to convey the thanks of the Council for the very effective support provided by the staff of the Secretariat.

Scientific Council in Session, September 1994





APPENDIX I. REPORT OF THE STANDING COMMITTEE ON FISHERY SCIENCE (STACFIS)

Chairman: H. P. Cornus Rapporteurs: Various

The Committee met at the Holiday Inn, Dartmouth, Nova Scotia, Canada, during 19-23 September 1994, to consider and report on various matters referred to it by the Scientific Council. Representatives from Canada, Denmark (in respect of the Faroe Islands and Greenland), Estonia, European Union, Iceland, Japan, Republic of Korea and the Russian Federation, and an observer from FAO were present.

I. REVIEW OF RECOMMENDATIONS

Recognizing the notes attached to the agenda reflected the recommendations from the Report of the June 1994 Meeting, STACFIS did not further consider recommendations at this meeting.

II. STOCK ASSESSMENTS

1. **Shrimp in Division 3M** (SCR Doc. 94/35, 75, 76, 77, 78, 79, 81, 82, 83, 85, 86)

a) **Introduction**

The shrimp fishery in Div. 3M began on 30 April 1993, when two Canadian offshore vessels were granted exploratory permits to fish for *Pandalus borealis* in the area. Activity increased thereafter to include about 50 vessels in early-July but subsequently declined over the remainder of the year. Only 4 vessels were reported fishing shrimp at the end of December.

Fishing continued into 1994, *albeit* at low intensity. Activity increased over winter to 21 vessels but then decreased in early spring. In May, effort began to increase again and the number of vessels grew from 16 to 47 by the middle of June. Thereafter, the number decreased to 30 as of the end of August.

Landings totalled approximately 28 000 tons in 1993 and 20 000 tons up to 31 August 1994. As many as 79 different vessels from 9 countries participated in 1993 compared to 72 vessels from 12 countries so far in 1994. Preliminary nominal catches by nation and year are given below.

Nation	1993 (tons)	1994 (to 31 August) (tons)
Canada	3 724	1 030
Denmark	800	375
Estonia		597
Faroe Is.	8 545	4 899
Greenland	3 786	2 126
Iceland	2 243	1 405
Latvia		261
Lithuania		1 150
Norway	8 700	8 100
Russia	300	25
Spain		250
St. Vincent		75
Total	28 098	20 293

b) **Input Data**

i) **Commercial fishery data**

Fishery information from Canada and Greenland indicated that the distribution of effort in 1994 differed from that observed in 1993 in that more fishing activity occurred in the western and southwestern areas of the Cap. The Greenland data showed that fishing was unproductive in eastern areas and that catch rates were maintained by concentrating effort in areas where densities were highest. The Canadian fishery in March 1994 produced low catch rates over the preferred grounds fished in 1993. Available data showed that catch rates were substantially lower in 1994 and there was no distinct decline in CPUE over the year, as had been observed in 1993.

Commercial catch sampling data showed changes in the size/age composition of the catches between the two years. Males were much more prevalent in the catches of several nations in 1994, compared to a clear domination by the female ages in 1993. The component of females present in 1994 was believed to be the remains of the strong 1988 year-class which cannot be expected to contribute substantially to the catches much longer.

Ageing of shrimp from commercial samples had been attempted by Canada, Faroe Islands, Iceland and Norway and there seemed to be a degree of consistency among interpretations. The Faroe Islands study showed a difference in growth rate of shrimp between Flemish Cap and the adjacent Div. 3L.

Icelandic and Faroese sampling data from May 1993 to August 1994 showed that females spawned primarily in August and their eggs hatched from March through May. It was concluded that the egg-bearing period lasts for about nine months.

The only data on shrimp discarding were from the Canadian fishery which showed low relative levels in all months, except for an estimate of 6.3% of the total shrimp catch in July 1993.

By-catch in 1993 consisted primarily of small redfish (mode at 14 cm) and Canadian observer data indicated levels of 9 and 13% of the total catch weight in May and June, increasing to 44% in July. Redfish were still a problem in 1994 (up to 32% in April), despite the mandatory use of sorting grates, and occurred in large numbers at 17-18 cm. If the Canadian data represented overall shrimp fishing conditions on the Flemish Cap, then it was highly likely that several thousand tons of small redfish had been taken as by-catch in both 1993 and 1994. Although sorting grates with bar spacings of 28 mm appeared largely ineffective to eliminate small redfish by-catch, they were very efficient at eliminating the larger sizes (>21 cm). By-catch of other commercial species in the Div. 3M shrimp fishery did not appear to be a problem.

ii) **Research survey data**

The EEC/EU groundfish surveys from 1988 to 1994 (text table below) showed that biomass in 1994 was substantially lower than observed during the 1991 to 1993 period, approaching the levels estimated for 1988 to 1990.

Year	Biomass (tons)	Average Catch per Mile (kg)	Standard Error
1988	2 164	1.54	± 0.28
1989	1 923	1.37	± 0.24
1990	2 139	1.53	± 0.21
1991	8 211	5.83	± 0.71
1992	16 531	11.75	± 1.86
1993	9 256	6.57	± 1.04
1994	3 337	2.37	± 0.35

The data further showed that decreases in 1994 were widespread, occurring throughout the survey area in all strata. The proportions of biomass estimated in western and southwestern strata in 1994 were higher than in the previous two years, consistent with the change in the distribution of fishing effort by the commercial fleet. Size/age composition data, over time, revealed the growth and maturation of the strong 1988 year-class.

c) **Assessment Results and Prognosis**

STACFIS noted that the assessment results and prognosis, and further clarifications as requested by the Fisheries Commission were addressed and reported by the Council. These are given in the Scientific Council Report above.

d) **Research Recommendations**

In 1993, STACFIS made three recommendations with respect to shrimp in Div. 3M and was pleased to note that some progress had been made with each:

- Commercial sampling of shrimp catches and commercial by-catch species was performed by some participating countries. These data were critical for the current assessment and STACFIS reiterated that all countries provide levels of sampling as recommended by NAFO Conservation and Enforcement Measures.

- The EU groundfish survey in 1994 provided data on shrimp distribution and abundance, as requested, continuing the time-series.

- No further analyses of existing data on predation by cod were available for this meeting to provide further insights into shrimp growth, distribution and/or abundance. However, a study (SCR Doc. 94/35) concluded that the abundance of shrimp on the Flemish Cap in summer makes them an important prey for several fish species. Wolffish, Greenland halibut and thorny skate were important predators of shrimp, and redfish (*Sebastes* spp.) fed on shrimp which migrated vertically, presumably, at night.

2. **Capelin in Divisions 3N and 3O**

In the light of the preliminary nature of the data from the Russian survey this agenda item was dealt with directly in Scientific Council (see Scientific Council Report above).

3. **Data Availability for Assessment of Northern Shrimp in November 1994**

STACFIS reviewed the availability of data for the forthcoming Scientific Council Meeting for assessment of northern shrimp in Subareas 0 and 1, and Denmark Strait.

Shrimp in Subareas 0+1. Participants from Canada and Greenland informed that data from the commercial fishery in 1994 (up to August-September), including catch statistics and catch rates, and also results from inshore and offshore trawl surveys in 1994 by Greenland will be available before the meeting.

Shrimp in Denmark Strait. Commercial fishery data from Greenland and Iceland, as well as results from a trawl survey by Greenland, will be available before the meeting.

STACFIS noted the meeting will be held at the NAFO Headquarters in November 1994. STACFIS proposed to change the scheduled dates to 18-21 November 1994, from the originally proposed dates of 17-20 November 1994.

4. **Fishery for Greenland Halibut with Longline *vs* Trawl in Div. 0B and Div. 1BCDEF**

In response to a request by Denmark (on behalf of Greenland and Faroe Islands) STACFIS considered the question as to whether the advised catch level for Greenland halibut would change if catches were to be taken by longline instead of trawl.

Data presented by Greenland on a comparison between longline and trawl catches in the Davis Strait in 1991 showed a distinct difference in selection by the two gears, where longlines were catching the larger and older fish. Further, a yield-per-recruit analysis showed a higher yield for longlines as compared to trawl, especially at low fishing mortalities.

STACFIS indicated that the precision in the current advice does not allow for an attribution of a catch level to specific gears, as stock composition at age is unknown, and as the relative fishing power of the gears need to be quantified. It was also noted, that the current fishing mortality is thought to be high, and thus the difference in yield-per-recruit for longline and trawl is considered to be small. It was further noted that the yield-per-recruit analysis was very sensitive to slight changes in the parameters. Thus the gear comparison should be treated with caution.

A change in gear to longlines would further change the sex ratio in the catches, as the large fish are mostly females, but STACFIS was not able to quantify the effect of such a change.

III. FISHERIES COMMISSION REQUESTS

STACFIS noted that all requests forwarded by the Fisheries Commission were dealt with directly by the Scientific Council.

IV. ARRANGEMENTS FOR CONDUCTING STOCK ASSESSMENTS AND PROPOSED FUTURE DOCUMENTATION

1. Adoption of Work Procedures for the June 1995 STACFIS Meeting

The Committee considered that the procedure followed at the June 1994 Meeting was very useful, when the first day of the meeting was utilized to agree on the best estimates of catches for the stock to be assessed. In addition, STACFIS proposed and welcomed to have presentation of surveillance data on the first day to enhance information on catches.

STACFIS noted the other procedural change where the second, third and fourth days were used for finishing and updating preliminary assessment work, prior to STACFIS taking up the stock-by-stock assessment work during the following week.

2. Updating List of Designated Experts

The Committee was informed that W. B. Brodie (Canada) was due to begin his term as Chairman of STACFIS as of September 1994, and he would not be in a position to undertake the tasks of the Designated Expert for American plaice in Div. 3LNO and yellowtail flounder in Div. 3LNO, and that M. J. Morgan (Canada) and S. J. Walsh (Canada) will take over these tasks, respectively. In addition, M. B. Davis (Canada) will replace C. A. Bishop (Canada) as Designated Expert for cod in Div. 3NO.

Recognizing the heavy workloads of the Designated Experts during the June Meetings, STACFIS in September 1993 felt it would be desirable to nominate one scientist per stock. Although this was not practical at the time, STACFIS noted some progress was being made with the changes this year. Accordingly, the list of Designated Experts for 1994 was reviewed and the following were tentatively identified for the 1995 assessments:

- From the Science Branch, Northwest Atlantic Fisheries Centre, Department of Fisheries and Oceans, P. O. Box 5667, St. John's, Newfoundland, Canada, A1C 5X1 [Telefax: (709) 772-4188; E-mail: NAME@NFLORC.NWAFC.NF.CA]

for	Cod in Div. 3NO	M. B. Davis
	Redfish in Div. 3LN	D. Power
	American plaice in Div. 3LNO	M. J. Morgan
	Witch flounder in Div. 3NO	W. R. Bowering
	Yellowtail flounder in Div. 3LNO	S. J. Walsh
	Greenland halibut in SA 2 + Div. 3KL	W. R. Bowering
	Roundnose grenadier in SA 2+3	D. B. Atkinson
	Capelin in Div. 3L	J. E. Carscadden
	Capelin in Div. 3NO	J. E. Carscadden
	Squid in SA 3+4	G. H. Winters
	Shrimp in Div. 3M	D. G. Parsons

- From the Instituto de Investigaciones Marinas, Muelle de Bouzas, 36208 Vigo, Spain [Telefax: +34 86 292762]

  for Cod in Div. 3M — A. Vazquez

- From the Instituto Espanol de Oceanografia, Centro Oceanografico de Cantabria, Aptdo 240, 39080 Santander, Spain [Telefax: +42 275072],

  for American plaice in Div. 3M — E. de Cárdenas

- From the Polar Research Institute of Marine Fisheries and Oceanography (PINRO), 6 Knipovich Street, Murmansk, 183763, Russia [Telefax: +47 789 10518; Telex: 126 111 PINRO; E-mail: PINRO@IMR.NO]

  for Redfish in Div. 3M — K. V. Gorchinsky

- From the Greenland Fisheries Research Institute, Tagensvej 135, 1, DK-2200, Copenhagen, Denmark [Telefax: +45 35821850],

for	Northern shrimp in SA 0+1	D. Carlsson
	Roundnose grenadier in SA 0+1	J. Boje
	Wolffish in SA 1	J. Boje
	Greenland halibut in SA 0+1	J. Boje

- From the Institut für Seefischerei, Fischkai 35, D-27572 Bremerhaven, Republic of Germany [Telefax: +49 431565876]

  for Redfish in SA 1 — H. J. Rätz

- From the Marine Fish Division, Department of Fisheries and Oceans, Bedford Institute of Oceanography, P. O. Box 1006, Dartmouth, Nova Scotia, Canada, B2Y 4A2 [Telefax: (902) 426-7827, E-mail: M_SHOWELL@BIONET.BIO.DFO.CA]

  for Silver hake in Div. 4VWX — M. A. Showell

- From the Marine Research Institute, Skulagata 4, P. O. Box 1390, 121 – Reykjavik, Iceland [Telefax: +354 1 623790]

  for Northern shrimp in Denmark Strait — U. Skúladóttir

The Secretariat was requested to confirm the availability of the Designated Experts from their respective laboratories.

3. Guidelines for Designated Experts

STACFIS highlighted that Scientific Council Research (SCR) Documents are scientific contributions to the Scientific Council from individual scientists, including preliminary stock assessments prepared by Designated Experts prior to the meetings.

The full contents of the preliminary assessment reports should be in the format of the assessment reports currently compiled in STACFIS reports. In addition, STACFIS noted the general guidelines for preparation of SCR Documents as agreed to by the Council in September 1993 should be followed. It was noted these guidelines are forwarded to scientists at the beginning of each year by the Secretariat in the Circular Letter series.

The format of the stock assessments to be presented in the Scientific Council Reports, however, would be a brief summary of the STACFIS accepted stock assessments and should only include:

- Reference to SCS Documents where the STACFIS accepted stock assessments can be found

- Reference to SCR Documents drawn upon for the assessment

- Description of the fishery

- Prognosis and management recommendation

- Summary sheet

- Basic graphs:

  i) Catch and TAC *vs* year
  ii) Abundance indices for analytical assessments
  iii) Recruitment and SSB *vs* year
  iv) Fishing mortality *vs* year
  v) Yield and SSB *vs* F for the year of projection
  vi) Any other graphs deemed essential for understanding the management advice

4. Status of Scientific Documents

Although only a few members of the Committee were present, there was a vigorous discussion on this topic. A proposal to change the documentation of assessment results in view of the agreed changes in the structure of the Scientific Council was not accepted by the Committee. The proposal would have placed the details of each assessments in separate SCS documents. The Committee agreed that the only change to past practice should be to transfer the section dealing with advice to the Report of the Scientific Council while retaining the summary of the assessment, including the discussion and the results, in the STACFIS report.

The Committee agreed that some improvements should be made to the assessment reports with citations and references to SCR and SCS Documents placed in the text against specific subjects discussed. It was also agreed that when information was obtained from working papers, those working papers should be improved and upgraded to SCR Document status, and then referenced in the assessment reports.

5. Guidelines for Documentation of Assessments

The Committee agreed on the following structure for documentation of survey results (where appropriate):

a) Description of designated area covered by the survey and season.

b) Description of differences to former years.

c) i) Description of survey methods (should be referenced).
   ii) If stratification is involved – description of stratification (should be referenced).
   iii) description of differences to former years.

d) i) Total survey results of biomass and abundance including standard errors, as time series.
   ii) Survey results (biomass, abundance) including standard error (where appropriate) by stratum, as time series.

e) i) Description of changes by time in population structure (age, length).
   ii) Description of changes by area in population structure.

f) Migration features, if appropriate.

g) Estimates of recruiting year-classes (year-class by year-class) and changes in estimation by year, if appropriate.

h) Mean length- or weight-at-age and length-weight relationship (if available).

V. FUTURE SPECIAL SESSIONS

1. **Report of 15-16 September 1994 Special Session on 'Impact of Anomalous Oceanographic Conditions at the Beginning of the 1990s in the Northwest Atlantic on the Distribution and Behaviour of Marine Life'.**

STACFIS reviewed the report of the Special Session on 'Impact of Anomalous Oceanographic Conditions at the Beginning of the 1990s in the Northwest Atlantic on the Distribution and Behaviour of Marine Life' held from 15-16 September 1994 at the NAFO Headquarters, as prepared by the co-conveners M. Sinclair (Canada) and M. Stein (EU-Germany). This report is appended as Annex 1 to this report.

STACFIS expressed its appreciation to the co-conveners for their preparatory work and convening of this Special Session. The Committee endorsed the Special Session **recommendation** that *long-term monitoring of oceanography properties (including plankton) as well as of fish distributions and abundance, be given high priority within the NAFO area in order to allow interpretation of fish population variations.* It was proposed that further elaboration for a monitoring program could be developed by STACFEN which will meet in June 1995.

2. **Progress Report on September 1995 Special Session**

This item was dealt with by the Scientific Council sessions.

3. **Progress Report on September 1996 Special Session**

STACFIS was not able to report any progress on this Special Session.

4. **Theme for September 1997 Special Session**

STACFIS discussions resulted in two tentative proposals given below. It was agreed that the representatives who proposed these topics would prepare outlines for further discussion at the June 1995 Meeting of the Scientific Council. The proposed titles are:

'Assessment of Fish Stocks When A Moratorium on Fishing Exists'. This session would examine methods of stock assessment which could be used in the absence of current commercial fishery data, or when such fishery data are considered inadequate.

'Fisheries Management by Effort Regulation'. The relationships between fishing activity, fishing effort, fishing mortality and fleet capacity could be considered along with their consequences for management.

VI. OTHER MATTERS

1. **Silver Hake Ageing Methodology Report**

In 1991 and 1992 the Scientific Council recommended that the results of various workshops on the ageing of silver hake be consolidated into a comprehensive document on methodological techniques for ageing this species. In response to this request, the Canadian scientists conducting studies on this species presented a proposed outline for such a manual for consideration by STACFIS, with the intention to present a completed document at the June 1995 meeting of the Scientific Council. STACFIS approved this proposal.

2. **Other Business**

There being no further business, the Chairman thanked the participants for their patience during the meeting and their valuable contributions to successfully complete the work of STACFIS.

Noting his term of office ends at the end of this meeting, the Chairman expressed his sincere thanks to STACFIS members for their support and cooperation during the often long and difficult discussions during his tenure. He also particularly thanked the Designated Experts for their hard work and the Assistant Executive Secretary and the Secretariat for the support afforded to him. He welcomed the incoming Chairman, W. B. Brodie, wishing him a successful and rewarding term.

ANNEX 1

REPORT OF THE SYMPOSIUM ON 'Impact of Anomalous Oceanographic Conditions at the Beginning of the 1990s in the Northwest Atlantic on the Distribution and Behaviour of Marine Life'

The following report prepared by the co-conveners was accepted by STACFIS during its meeting of 19-23 September 1994.

Introduction

The Symposium on 'Impact of Anomalous Oceanographic Conditions at the Beginning of the 1990s in the Northwest Atlantic on the Distribution and Behaviour of Marine Life', with M. Sinclair (Canada) and M. Stein (EU-Germany) as co-conveners, was held at the NAFO Headquarters, Dartmouth, Nova Scotia, Canada during 15-16 September 1994. Twelve papers were presented (SCR Doc. 94/63-74). The Symposium was opened by H.-P. Cornus (STACFIS Chairman – EU-Germany).

M. Sinclair introduced the theme of the meeting with an historical account of the shift in the conceptual framework of the fisheries fluctuations problem that occurred during the first decade of ICES research activities. The title of the talk was "Fisheries Fluctuations: the Paradigm Shift of Committee A (1902-14)". At the turn of the century the existing hypothesis accounting for interannual and decadal scale fluctuations was that migration changes at the species level, forced by changing oceanographic conditions (on ocean-basin scales), generated variable abundance at diverse fishing locations along the coast of Europe. The new hypothesis of Hjort (1914), based largely on the work of Committee A of ICES, emphasized the role of year-class variability of geographically restricted stocks as the major cause of fluctuations in catches. In recent years migration changes due to oceanographic variability are considered to be an important component of the "fisheries fluctuations" problem. Thus the speaker proposed that a balance between the "migration thinking" of the 19th century and the "population thinking" of the 20th century will probably be the conceptual framework of the 21st century.

A total of 31 participants registered for the Symposium, representing 12 countries (Canada, Denmark, Faroe Islands, France, Germany, Greenland, Japan, Portugal, Spain, Russian Federation, United Kingdom and the United States of America).

Summary of Contributions

Four papers (SCR Doc. 94/69-72) were presented on the changes in the environmental conditions of the North Atlantic on a range of time and space scales. On a time scale of a century, it was shown that the cold atmospheric conditions off West Greenland during the past two decades were comparable to those at the turn of the century, and as such were not.anomalous. On a shorter time scale (i.e. the past several decades), however, the oceanographic conditions of the 1980s and the early-1990s were shown to be colder than average (relative to the 1961-1990 mean) for most of the Northwest Atlantic from West Greenland to about the eastern Scotian Shelf. In contrast the conditions in the eastern part of the North Atlantic (Iceland to Europe) had been warmer than average during the past decade. The environmental conditions over the western Scotian Shelf, the Gulf of Maine area and the Mid-Atlantic Bight had been average. The changes in environmental conditions, as well as their pattern, were described. The major change had been shifts in the winter wind conditions (the intensity and direction of the northwesterlies) over time, which in turn modified the advection of cold water from the Davis Strait *via* the Labrador Current. The shift in the winter winds (which are generated by the relative air pressure strengths of the Icelandic Low and the Bermuda-Azores High) bring warmer air temperatures over the eastern seaboard of the United States, when the cooler than normal conditions are being generated in the Northwest Atlantic. Thus the southern part of the NAFO area had been experiencing average environmental conditions during the past decade, while the northern part had been cooler than average. On shorter time scales (within season) it was shown that anomalous advection of Scotian Shelf water across the Northeast Channel can displace Georges Bank water. This occurred in the winter spring of 1992, and may have had an impact on gadoid recruitment processes. The four papers on the oceanographic conditions within the NAFO area provided an excellent framework within which to summarize the degree to which the past several years had been anomalous. In the summary discussion it was concluded that on a time scale of interest to fisheries management (i.e. years to decades) the early-1990s had been very cold for most of the NAFO area.

Four papers (SCR Doc. 94/64, 66, 67 and 73) evaluated trends in spawning stock biomass (SSB), recruitment, survival rate (i.e. recruitment over SSB), and growth of fish as a function of changing environmental conditions and fishing pressure. It was concluded that survival rate had been relatively low during the past decade. Also weight-at-age and growth rates had been low for several cod stocks, but not all. To a certain degree the recent patterns in growth rate changes and weight-at-age follow the broad patterns in changes in environmental conditions. Weights-at-age for Div. 2J+3KL cod, Div. 4T cod, Div. 4VsW cod and annual growth rate for Div. 2J+3KL cod had been declining during the cool period. In contrast growth rates for Icelandic and Arcto-Norwegian cod, and weights-at-age for the Gulf of Maine area cod (Div. 4X and 5Z) had either been stable or high during the respective average and warm periods. It was also noted that fishing mortality had been increasing during the time period of stock declines in many areas. Thus fishing had contributed to the rate of decline of the stocks during a time period which had been poor for fish production over a large part of the NAFO area. There was some evidence that cod recruitment variability off West Greenland was associated with increased advection of warm oceanic waters and that temperature and current strength off Atlantic Canada influenced recruitment for a range of fish species (groundfish and pelagic).

Four papers (SCR Doc. 94/63, 65, 68 and 74) addressed changes in distribution of fish species in response to the cool period of the last several years. There was strong evidence that capelin and Greenland halibut had expanded their distribution to the Scotian Shelf in parallel with the declining temperatures on the eastern shelf. Spawning times of capelin have been 4-6 weeks later since 1991. Capelin have also appeared on Flemish Cap in recent years. American plaice were observed more frequently in deeper water within Div. 3LNO than had been the case prior to the 1990s. Silver hake were shown to be associated with the shelf/slope front off the Scotian Shelf. On short time scales (weeks), silver hake were observed to change their distribution in relation to shifts in the position of the front.

During a general discussion, it was **recommended** that *long-term monitoring of oceanographic properties (including plankton), as well as of fish distributions and abundance be given high priority within the NAFO area to allow interpretation of fish population fluctuations.* The consensus of the participants was to publish the papers and the discussion from the symposium in a special publication. The co-conveners thanked the Secretariat for their help in the preparation of the papers and their support at the meeting.

List of Participants

Canada

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Manning, J.	NOAA/National Marine Fisheries Service, 166 Water St., Woods Hole, MA 02536

APPENDIX II. REPORT OF STANDING COMMITTEE ON RESEARCH COORDINATION (STACREC)

Chairman: C. A. Bishop Rapporteur: D. B. Atkinson

The Committee met at the Holiday Inn, Dartmouth, Nova Scotia, Canada on 19-23 September 1994, to discuss various matters pertaining to statistics and fisheries research in the Regulatory Area, as referred to it by the Scientific Council. Representatives from Canada, Denmark (in respect of Faroe Islands and Greenland), Estonia, European Union, Iceland, Japan, Republic of Korea and Russian Federation, and an observer from FAO of the United Nations, were present.

1. Acquisition of STATLANT 21 Data

The Secretariat reminded the Committee that it had been unable to provide a preliminary list of 1993 catches in June because many countries had not submitted their STATLANT 21A data. Information from Cuba, Estonia, Faroe Islands and Lithuania was still not available so it was still not possible to tabulate updated information on fishery trends. Recognizing the requirement to submit these data in advance of the June meeting, STACREC emphasized this was a serious lapse this year.

2. Publication of Statistical Information

The Secretariat reported that since June 1994, data for 1991 had been received from Denmark so that the only missing information was from France-SP. The French data were also missing from previous years (1989 and 1990), and the Committee agreed that the *NAFO Statistical Bulletin* Vol. 41 for 1991 should be published without these data as had been done for 1990.

Data for 1992 were still missing from EU-France, France-SP and Lithuania. Data had been received from the Russian Federation and Canada but require some clarifications before they could be finalized. Although data were not yet available from the United States, the Secretariat had been informed they should be available soon. STACREC encouraged the Secretariat to make contact with the relevant statistical offices to obtain the required data and finalize the publication of the *Statistical Bulletin* Vol. 42 for 1992.

It was reported that EU-France data were now available separated between metropolitan catches and St. Pierre-Miquelon catches for 1983-85, and an update of the revisions for these years will be included in the next issue of the Statistical Bulletin.

3. Report of CWP *Ad hoc* Consultation of 11-15 July 1994

The Report of the CWP *Ad hoc* Consultation in Madrid, 11-15 July 1994, was made available and summarized to STACREC by R. Grainger of FAO, the CWP Secretary. It had been recognized by the Consultation that new demands for statistics from Regional Fishery Organizations will probably result from developments at the UN Conference on Straddling Fish Stocks and Highly Migratory Fish Stocks and hence the need for improved coordination amongst organizations. It may also become desirable to expand the horizons to areas outside the Atlantic. During the consultation it was agreed that a two step process should be followed. First, revised Statutes and Rules of Procedure would be prepared, discussed and agreed upon. Later there would be careful consideration of the idea of expanding the area covered during CWP discussions. During the consultation, proposed new Statutes and Rules of Procedure were developed including more focused terms of reference which could be referred to the member organizations for their revisions.

STACREC reviewed the proposed Statutes and subject to making a few minor changes recommended that they be accepted. It was also agreed that the term "Atlantic" should be dropped from the title of the working party. STACREC was also in general agreement with the proposed Rules of Procedure.

The Consultation Report along with suggested minor changes to the proposed Statutes are contained in NAFO SCS Doc. 94/20.

The Committee noted that the 16th Session of the CWP was now scheduled for late-March 1995, rather than February. Attendance by C. A. Bishop (STACREC Chairman), the Assistant Executive Secretary and the representative from Spain, E. de Cardenas was reconfirmed.

4. Non-traditional Fishery Resources in the NAFO Area

The Chairman pointed out that this issue had been discussed briefly during the June 1994 Meeting, but that there was a need identified at that time for further discussion and consideration. The idea of maintaining a database of research survey data at NAFO was discussed. The Committee agreed that with the decline in the fishery for most of the traditional species, increasing pressure would occur on non-traditional species but there is little information on these in the literature. Information concerning distribution and abundance of such species as skates and wolffish can, however, be found in many of the research survey databases held by Contracting Parties and STACREC **recommended** that *efforts be made to analyse data on distribution and abundance of non-traditional species such as skates and wolffish contained in research survey databases held by Contracting Parties, and present the results of these analyses during the June, 1995 meeting.* The information will serve as useful background when considering these fisheries in the future.

5. Data from the Pilot Observer Program

In June 1994, STACREC noted the potential usefulness for assessment work of data obtained from the Pilot Observer Program and requested Scientific Council to investigate the availability of these data. Information from Fisheries Commission documentation suggests that there are data available, but accessibility was still unknown since the data belong to the collecting Contracting Party. It was also not clear as to what data were required to be collected, and it appeared that the amount of information ranged from very detailed to summary data on daily catches, as well as sampling data, depending on the Contracting Party involved. It was agreed that national representatives should investigate within their own countries the accessibility to data collected during this pilot project and report on their findings in June 1995. If the data are accessible, they should be made available to Designated Experts prior to June 1995, along with other required data.

6. Updating of Conversion Factors

In June it was noted that FAO was in the process of updating their previously published document on conversion factors, and STACREC should wait for this update before further considerations of this topic. It was reported to the Committee by R. Grainger (FAO, CWP Secretary) that FAO had sent out questionnaires on this topic and responses were required by the end of 1994. Thus additional information should be available at the 16th Session of the CWP in March 1995. Two separate consultants' reports had been received by FAO: the first was a review of existing factors used at sea, and the second included a review of the first as well as examining both sea and land based conversion factors. Reports of these should also be available during the 16th Session of the CWP.

The Committee agreed to await the reports expected in March and then discuss the issue further during the June 1995 meeting.

7. Research Coordination for Greenland Halibut

The EU representative reported that a proposal for a long-line survey in Div. 3LMNO in depths of 800-2 000 m had been submitted to their authorities, and that it appeared that approval for this would be received. The Spanish representative expressed interest in coordinating this survey with the annual Canadian spring or autumn groundfish surveys so that calibrations can be attempted between the bottom trawl and long-lines fishing in the same area. Canadian scientists reported that it might be better to coordinate with the Canadian autumn survey since this usually covers a larger area (Div. 2J and 3K) than that in the spring. The EU noted that they were flexible and this idea could be easily accommodated. It was also noted that Canada and EU could discuss the possibility of associated scientific exchanges between themselves. Representatives from Greenland indicated that they were very interested in this research activity and would like to participate in any way they could be helpful. As a minimum, they would appreciate being informed of progress as results become available. STACREC emphasized that during these studies, efforts should be made to collect oceanographic data, and further, these should be presented to Scientific Council when analyzed.

The representative from Japan noted that at present they conduct deepwater surveys in Davis Strait in collaboration with Greenland. They have proposed to expand this work so as to conduct deepwater surveys in Subareas 2 and 3 in 1995 and were awaiting final approval from their government for funding support. The Committee was pleased to hear this, but cautioned that close coordination with Canada would be necessary, particularly if Japan was proposing to work inside the Canadian Zone.

STACREC noted that the Fisheries Commission during its 19-23 September 1994 meeting, when considering the Greenland halibut fisheries, had requested the Scientific Council to submit a proposed outline of research surveys that should be undertaken. The research proposal was discussed by the Council, and reported in Scientific Council Section II.3c above.

The Secretariat noted that they now receive brief trip reports of research surveys conducted by some Contracting Parties. While it was agreed that these preliminary reports are produced by all Contracting Parties at the end of research surveys, it was unclear whether forwarding these to the Secretariat for compilation and distribution during June meetings would be problematic or not. National representatives of Contracting Parties currently not submitting their reports to the Secretariat were requested to investigate the feasibility of adding NAFO to their mailing lists for these summaries, and report back to STACREC in June 1995.

8. **Review of Research Documents**

A total of ten Research Documents were tabled for review by STACREC. Seven of these were presented by the authors or their representatives and the reviews are presented below.

a) **Mean length at 50% Maturity of Atlantic Cod in Subdivision 3Ps: Year to year Variations and Comparison of Samples from Burgeo Bank, St. Pierre Bank and South Slope** (SCR Doc. 94/11)

Median length at 50% maturity of Atlantic cod in Subdiv. 3Ps were calculated using data from French research surveys annually conducted in the spring from 1978 to 1992. The area was divided into three subareas (Burgeo, South Slope and St. Pierre Bank) and L_{50} was calculated for each of these subareas. The values were compared annually in order to study the possibility of using shifts in the values as an indicator of mixing with neighbouring stocks (mixing with Div. 4R cod on Burgeo Bank and with Div. 3O cod in the South Slope). Year to year variations were also studied for the St. Pierre Bank area.

Year to year variations in the L_{50} of St. Pierre Bank cod showed some changes but related to the time of observation. The comparison between the South Slope values and the St. Pierre Bank values did not show differences except for one year (1991). Comparison between Burgeo Bank and St. Pierre Bank showed significant differences in L_{50} for the years 1984, and 1986 to 1991. The values calculated for Burgeo Bank were lower than those calculated for St. Pierre Bank and similar to values observed previously for cod in Div. 4R. An analysis of stratum by stratum in this area showed increasing values from west to east that could be interpreted as deceasing levels of mixing.

b) **Diet of Flemish Cap Cod with Particular Reference to Predation on Redfish: 1988-93** (SCR Doc. 94/24)

A review of all information on cod predation obtained from the EU surveys on the Flemish Cap between 1988 and 1993 was presented. Hyperidae for small fish and redfish for medium and large sized cod were the dominant prey. A decrease in importance of redfish as a prey was observed in 1992 and 1993, and it coincided with a decrease in the condition factor of the cod.

c) **Feeding of Most Abundant Fish Species on Flemish Cap in Summer 1993** (SCR Doc. 94/35)

The analysis of stomach contents of 14 species of fish on the Flemish Cap indicated three main patterns of feeding: the pelagic constituted by redfish which feed on planktonic and vertically migrating species; the benthic, constituted mainly by most flatfishes, wolffishes and eelpouts which feed on benthic and vertically migrating species; and the benthopelagic feeders constituted by Gadiforms and Greenland halibut, which have a mixed diet. The hyperiids, shrimp and redfish constituted the most important resources on the Flemish Cap.

d) **Length and Age of First Maturation of Flemish Cap Cod in 1993 with an Histologic Study** (SCR Doc. 94/26)

The histological analysis of cod ovaries sampled during the EU survey in July 1993, was the basis for a study of spawning frequencies. According to the presence of oocytes in cortical alveoli stage (as the indicator of next year spawners), 50% maturation corresponded to 50 cm length and 4 year old fish. According to the presence in the ovary of postovulatory follicles (as an indicator of past spawners), 50% maturation corresponded to 64 cm length and 5 year old fish.

e) **Summary of Age Training for Silver Hake** (SCR Doc. 94/34)

The responsibility for silver hake ageing was assumed by Marine Fish Division personnel at the Bedford Institute of Oceanography in 1992. Ageing was conducted by a new reader and training was therefore initiated to ensure consistency with historical ageing results and to minimize bias between new and old readers. The NAFO protocol for ageing silver hake were followed. The results of training indicated that the precision of ages by the new age reader are similar to those for historic samples.

f) **A Review with Some Proposals for Amendments of the Catch Statistics for the Cod Fisheries in Greenland Waters Since 1911** (SCR Doc. 94/38)

In preparation of a special volume of the NAFO Journal, concerning a review of the cod fishery in Greenland waters during this century, it was found necessary to review, country by country, and partly revise the catch statistics for the cod fishery at West, as well as, East Greenland for the whole period.

It was decided that the review of the statistics should not be included in the intended volume of the Journal because it would make it too detailed and heavy to read. It was, therefore, proposed that the present review should not occur in the Journal, but be available upon request as a NAFO document. The first issue of this paper was distributed in April 1993 by the NAFO Secretariat as a working document to national representatives. Comments and advice received during 1993 and 1994 of the revision of the recorded ICNAF/NAFO catch and effort statistics is included in the present issue.

g) **Age Structure of Roughhead Grenadier (*Macrourus berglax*) on Flemish Cap, 1994** (SCR Doc. 94/80)

Roughhead grenadier catches on the EU survey in July 1994 were aged through otoliths reading. Results indicated a multi-aged population, a slow growth rate of the species, a faster growth rate after age 6 in females than in males, and a dominance of the 1986 year-class, aged 7 years, in the actual stock.

The remaining three papers were tabled, but in the absence of the authors or their designated presenters STACREC decided that a review would not be appropriate and that the present report would only include information from the abstracts provided. It was also considered that the subject matter of SCR Doc 94/84 was stock assessment related, and should be considered by a larger group of experts at the 1995 June Meeting. Only the title of this paper is provided below.

h) **On the problem of the Commercial Fish Populations Abundance Control in the Northwest Atlantic Since 200-miles Economic Zones Enforcement** (SCR Doc. 94/5)

An attempt was made to reveal major trends in abundance regulation of commercial fish populations in NAFO Subareas 2-4 in 1977-92, classified according to the geographical patterns taking into account the 200-mile economic zone. Three population groups were determined as follows: Those distributed in the northern edge of the species area and the 200-mile zone, those in the middle area of the species area and 200-mile zone, and those partially or entirely distributed in the NAFO Regulatory Area.

For the first group of populations, abundance seemed to be controlled mainly by oceanographic factors, and it was concluded that under persistent unfavourable conditions for the juvenile fish survival, even the total fishery prohibition will provide no positive effect. The stock state dynamics of the second group showed that maintenance of the optimum fishing mortality levels for some populations seemed to be the main method of abundance regulation. As for the third group, the danger of overfishing required a strict control over the observation of fishery regulations, and the maintenance of optimum fishery mortality level was a necessary condition for successful control of the abundance of that group. Besides, possible environmental effects upon the juvenile fish survival and adult fish distribution should be considered in any case.

i) **Composition of Bottom Trawl Catches at Different Depths off the Flemish Pass in 1989-1993** (SCR Doc. 94/29)

Analysis for Russian bottom trawl catches taken at 100-800 m depths in May-July 1989-93 and in September-October 1991-93 indicated a minor portion of the catch was Greenland halibut (11%) and that of *Sebastes marinus* constituted 51.8% from catches up to 800 m depth. Skate constituted 26.8% from catches taken at 211-300 m depths.

Greenland halibut below 50 cm in length from depths less than the 901-1 000 m stratum, and *Sebastes mentella* smaller than 30 cm at depths up to 800 m, were predominant in catches. Mean length of these fish species increased with an increase in fishing depth.

According to NAFO statistics in 1990-92 the roundnose grenadier by-catches, taken by vessels from EU-Spain and EU-Portugal during the Greenland halibut fisheries in the Flemish Pass area (Div. 3L, 3M, 3N), made up on the average 13-14% of total catch (the highest was 25% in Div. 3M).

j) **On Stability of Cod Stock Estimates in NAFO Area 2J+3KL** (SCR Doc. 94/84)

STACREC proposed this paper be reviewed at the June 1995 Meeting.

9. Acknowledgements

The Chairman expressed his gratitude to the Secretariat, the rapporteur, and all participants for their assistance in compiling all of the information necessary for the meeting.

APPENDIX III. REPORT OF STANDING COMMITTEE ON PUBLICATIONS (STACPUB)

Chairman: W. R. Bowering Rapporteur: M. Stein

The Committee met at the Holiday Inn, Dartmouth, Nova Scotia, Canada on 22 September 1994. In attendance were W. R. Bowering (Canada, Chairman), K. H. Nygaard (Greenland), M. Stein (EU-Germany), A. Vazquez (EU-Spain) and the Assistant Executive Secretary (T. Amaratunga).

1. Review of Scientific Publications

a) Publications Since June 1994 Meeting

i) Journal of Northwest Atlantic Fishery Science

The Assistant Executive Secretary updated STACPUB on progress since the June 1994 Meeting. It was noted that:

Volume 16 containing 7 miscellaneous papers was published with a publication date of July 1994.

Volume 17, containing papers presented at the November 1990 Canada-USSR Meeting on Capelin, has 5 papers *in the final stages* of preparation. This issue is expected to be completed by mid-1994.

Volume 18, containing the papers presented at the NAFO 1993 Symposium on "Gear Selectivity/Technical Interactions in Mixed Species Fisheries" originally expected to be completed in late-1994, will be delayed in completion since there have been further delays in the editorial process of some manuscripts. Noting the importance of completing this publication as soon as possible, STACPUB **recommended** that *conveners of the 1993 symposium be requested to inform STACPUB on the anticipated time of completion.*

ii) NAFO Scientific Council Studies

Studies Number 21, containing 9 papers dealing with Northern Cod is in the final stage of preparation. The publication of this issue is expected to be completed by the end of 1994.

There are presently 4 miscellaneous papers in hand at the Secretariat which are in the process of being edited. The paper on Environmental Overview (K. Drinkwater) has been announced to arrive soon at the NAFO Secretariat.

b) Proposals for Future *Publications*

Of the 13 papers nominated at the June 1994 Meeting, 3 responses have been received from authors indicating their intent to submit.

In addition, 1 paper from outside of the STACPUB nomination process was submitted since June 1994.

2. Promotion and Distribution of Scientific Publications

a) Invitational Papers

Papers for the single issue publication on West Greenland cod is being compiled by the coordinator (H. Lassen). One paper has already been published in the Journal and STACPUB noted another paper is near completion for final publication in the Journal.

STACPUB was informed that there was no progress in getting more invitational papers, mostly due to time constraints and workload of potential authors.

The incoming STACFEN Chairman (M. Stein, EU-Germany) indicated that he will provide an overview paper on Flemish Cap oceanography during the Scientific Council Meeting in June 1995, provided that database permits such an overview.

b) **Promotion of the Journal**

STACPUB was informed that there was no activity to be reported.

3. **Editorial Matters**

There were no changes in the editorial board, and there was nothing new brought to the attention of STACPUB on this matter.

4. **Review of Papers for Possible Publication**

a) **Consideration of Publication of Papers from September 1994 Special Session**

There was considerable discussion on the possibility of publishing the Symposium contributions in one volume including a summary of discussions and the individual questions and answers to the papers presented. STACPUB did not find a solution for getting all contributions under the umbrella of one NAFO publication (i.e. Journal or Studies) since the quality of papers were of different levels. The conveners of the Symposium were requested to contact the authors of the Symposium papers and seek a common denominator for a combined publication. STACPUB **recommended** that *a discussion be initiated during the June 1995 meeting to consider a publication series similar to ICNAF Special Publication Series to provide a collated volume of Symposium contributions.*

b) **Papers Presented at This Meeting**

There being a considerable number of current publications on shrimp on Flemish Cap where a new fishery has developed, STACPUB **recommended** that *during the Scientific Council Meeting on northern shrimp in November 1994, the views of the authors should be solicited with respect to a possible single publication of papers on shrimp on Flemish Cap.*

c) **Consideration of Papers Being Presented at November 1994 Shrimp Meeting**

There being no STACPUB meeting during the November 1994 Shrimp Meeting, papers being presented then will be considered by STACPUB at its June 1995 Meeting.

5. **Other Matters**

The Chairman noting that there were no other matters, closed the meeting by thanking the participants for their contributions and cooperation. A special thanks was afforded the NAFO Secretariat for preparing the documentation and the rapporteur, M. Stein for his assistance while being an active participant.

PART D

Scientific Council Meeting, 18-21 November 1994

CONTENTS

REPORT OF SCIENTIFIC COUNCIL

Special Meeting, 18-21 November 1994

Chairman: H. Lassen Rapporteur: T. Amaratunga

I. PLENARY SESSIONS

The Scientific Council met at NAFO Headquarters, Dartmouth, Nova Scotia, Canada, during 18-21 November 1994. Representatives attended from Canada, Denmark (in respect of the Faroe Islands and Greenland) and Iceland. The Chairman, H. Lassen (EU-Denmark) had conveyed his regrets not being able to attend and Vice-Chairman, W. R. Bowering (Canada), had been invited to chair this meeting. The Assistant Executive Secretary was in attendance.

The opening session was called to order on 18 November 1994 at 1000 hr.

The Chairman, W. R. Bowering, welcomed representatives to this Special Meeting of the Scientific Council to conduct assessments on shrimp in Subareas 0 and 1, and Denmark Strait. The Assistant Executive Secretary was appointed rapporteur.

In considering the Agenda, the Chairman noted that at its meeting in September 1994, the Council had recommended that a single publication on papers dealing with shrimp on the Flemish Cap be considered at this meeting, and proposed that this matter be considered under 'Other Matters'. The Provisional Agenda was **adopted** with this item inserted appropriately (see Agenda IV, Part E, this volume).

The Council noted that STACFIS would undertake the assessments of the stocks, while the prognoses and the advice would be undertaken by the Council. The Chairman also highlighted the Scientific Council decision of September 1994, that the assessment reports must in their texts clearly cite the particular documents used during the assessments, in addition to presenting a list of all the documents in the subject heading.

The meeting was adjourned at 1015 hr.

The concluding session was convened at 1600 hr on 21 November 1994, noting that the shrimp assessment reports had been prepared by STACFIS. The Council then addressed the requests of the Coastal States considering the results of the assessments and provided advice and recommendations. The meeting was adjourned at 1615 hr.

Brief summaries of the STACFIS Report and other matters considered by the Scientific Council are given below in Sections II-IV. The Agenda, List of Research (SCR) and Summary (SCS) Documents, and the List of Participants of this meeting are given in Part E, this volume.

II. FISHERY SCIENCE (see STACFIS report, App. I)

1. Stock Assessments

a) Shrimp in Subareas 0 and 1

i) Advice and Recommendations

Shrimp in Subarea 1 and adjacent areas of Div. 0A. At its meeting in November 1993 the Scientific Council recommended, based on the similarity in stock composition (i.e. the occurrence of similar modes in length distributions, prominence of the 1985 year-class in all areas, and recruitment of the same year-classes in all areas), that shrimp in Div. 0A and in Subarea 1 both north and south of 71°N and in inshore areas be assessed as a single stock.

At the present meeting STACFIS reviewed the available information on catch, catch rates, biomass estimates, and commercial and survey length distributions in the three areas. It was concluded that due to the lack of catch rate and catch composition data in the inshore areas, it was most appropriate to review data from each of the three areas separately for the current assessment, as follows:

Subarea 1 offshore, north of 71°N. Catches in this area declined rapidly to a low level following a few years in which catches exceeded 10 000 tons. Biomass estimates were now at the lowest level observed in the time series. Regardless of whether the reduction was due to environmental factors and/or fishing pressure the Scientific Council concluded that, due to the current depressed status of this component, no increase in the total TAC should be based on the inclusion of this area. Nevertheless, any catches in 1995 from this area should be counted against the TAC for the total stock area.

Subarea 1 inshore. Catches in this area were relatively stable during 1990-92 but have declined in 1993-94 due to a shift in effort to offshore areas. This could be attributed to more attractive catch rates offshore, as inshore biomass estimates have been relatively stable during 1991-94, while offshore surveys have shown a considerable increase in abundance in nearby areas in recent years. In the absence of commercial fishery data needed to assess the status of this component, the Scientific Council concluded that the average of recent catches (1990-93) was the best available estimate of production. The Scientific Council hence **advised** that this stock component contribute 10 000 tons to the TAC for the total stock area in 1995.

Subarea 1 offshore south of 71°N and adjacent areas in Div. 0A. Total catches in this area had increased steadily up to 1992 and exceeded the advised TAC by more than 35% in 1992 and 1993. Standardized catch-rate indices from Div. 0A and Subarea 1 all showed the same decline from 1993 to 1994, to the lowest value in the time series, after a period of stability maintained by the strong 1985 year-class. Biomass estimates from surveys have been relatively stable since 1988, largely maintained by the 1985 year-class. Comparison of year-class strength showed that subsequent year-classes recruiting to the fishery were substantially weaker, and it is these year-classes which will determine the success of the 1995 fishery. In the light of the above, the Scientific Council **advised** that the 1995 catch for this stock component be reduced to the currently advised TAC of 50 000 tons.

Total stock area (Div. 0A and Subarea 1). Based on considerations from the three areas discussed above, the Scientific Council **advised** that the total allowable catch for the entire stock area be set to 60 000 tons in 1995.

b) **Shrimp in Denmark Strait**

i) **Advice and Recommendations**

In consideration of the continued low level of shrimp stock abundance in Denmark Strait and the uncertainty in the interpretation of the abundance indices, the Scientific Council in 1993 advised a TAC of 5 000 tons for 1994. It further advised that this level would have to be maintained for several years in order to be effective in rebuilding the stock.

The current assessment reviewed by STACFIS concluded that there appeared to be some improvement in the stock abundance between 1993 and 1994 based upon analyses of commercial catch-rate data and research vessel survey results. There was some concern expressed, nevertheless, that the proportion of female shrimp in the stock, which is the main contributor to the commercial catch, remains relatively low. The Scientific Council therefore **advised** that the TAC of 5 000 tons recommended for 1994 remain for 1995 to allow for continued improvement in stock size. This catch level is intended to include any catch in new fishing areas.

SUMMARY SHEET - Shrimp in Subareas 0 and 1

Source of Information: SCR Doc. 94/88, 89, 93, 94, 95.

Year	1987	1988	1989	1990	1991[1]	1992[1]	1993[1]	1994[1]
Offshore SA 0+1 (south of 71°N)								
Recommended TAC	36	36	44	50	50	50	50	50
Agreed TAC[2]	40.1	40.1	45.2	45.2	46.2	44.2	40.6[3]	42.3[3]
Actual landings[4,5]	46.1	43.4	49.9	58.2	63.1	68.8	68.2	52.4[6]
Offshore* SA 1 *(north of 71°N)								
Recommended TAC	-	-	-	-	-	-	-	-
Agreed TAC	11.6	11.5	8	6.8[7]	6.8[7]	6.4[7]	8.3[8]	8.3[8]
Actual landings	10.7	6.7	2.5	2.1	1.1	2.6	0.6	0.4[6]
SA 0+1 total (including inshore SA 1)								
Actual landings[4,5]	63.7	60.3	65.7	70.7	75.3	84.9	74.6	66.9[6]

Weights in '000 tons

[1] Provisional landings.
[2] Not including catches of vessels <75 GRT.
[3] SA 1 offshore, south of 68°N + Div. 0A.
[4] Includes information in addition to official statistics.
[5] Revised data for 1990-93.
[6] Preliminary statistics available as of November 1994.
[7] Including the area from 69°30'N to 71°N, west of 58°W.
[8] SA 1 offshore, north of 68°N.

Catches: For the area where the TAC had been applied, catches had increased steadily up to 1992 and exceeded the advised TAC by more than 35% in 1992 and 1993.

Data and Assessment: Catch rates, research survey indices and biological sampling data.

Fishing Mortality: No information available.

Recruitment: Recruitment of 1988 and 1990 year-classes *indicated but weaker than the 1985 year-class*.

State of Stock: Catch-rate indices indicated declining abundance; research survey indices indicated that the stock has been stable since 1988.

Forecast for 1995: Not available.

Option Basis	Predicted catch (1995)	Predicted SSB (1.1.1996)
$F_{0.1}$ = F_{93} = F_{max} =	No information available.	

Recommendations: TAC for 1995 be set at 60 000 tons for Div. 0A and Subarea 1 including areas north of 71°N and inshore areas.

Special Comments: Area covered by TAC for 1995 now includes all of SA 1 and Div. 0A compared to previous years.

SUMMARY SHEET - Shrimp in Denmark Strait

Source of Information: SCR Doc. 94/90, 91, 92, 96, 97.

Year	1987	1988	1989	1990	1991	1992	1993	1994
Recommended TAC	-	-	10	10	10	8	5	5
Agreed TAC[1]	7.7[2]	8.7[2]	9.0[2]	14.1	14.5	13.0	9.6	9.6
Reported catches	12.2	12.6	10.7	10.3	8.7[3]	7.5[3]	7.8[3]	8.1[3]
Sp. stock biomass								
Recruitment				No information available.				
Mean F								

[1] On Greenland side of midline only.
[2] Not including Greenland fishery north of 66°30'N.
[3] Provisional.

Weights in '000 tons

Catches: In 1993, a fishery started in new areas south of the traditional area, where 1 300 and 3 700 tons were caught in 1993 and 1994, respectively.

Data and Assessment: General biological data, catch and effort data from the fishery, unstandardized catch-rate series of the years 1980-94 and standardized catch-rate series for the years 1987-94. Research vessel survey data for 1989, 1990, 1992 and 1994.

Fishing Mortality: Not known.

Recruitment: Not known.

State of Stock: Although the indices suggest an increase in abundance, the stock is still considered to be at a much lower level than it was during the first half of the 1980s.

Forecast for 1995:

Option Basis	Predicted catch (1995)	Predicted SSB (1.1.1996)
$F_{0.1}$ =		
F_{93} =	No information available.	
F_{max} =		

Recommendations: The Scientific Council advised that the TAC of 5 000 tons recommended for 1994 remain for 1995 to allow for continued improvement in stock size. This catch level is intended to also include any catches in the new fishing areas.

Special Comments:

III. OTHER MATTERS

1. **Publication of Papers on Flemish Cap Shrimp**

The Council at its meeting in September 1994 recommended that consideration be given to publication of papers dealing with shrimp on Flemish Cap. The Designated Expert, D. G. Parsons (Canada), who was requested to address this matter, informed the Council that he had consulted potential contributors and was in a position to formulate a compilation. The Council agreed to consider a draft of the proposed single publication during its meeting in September 1995.

IV. ADOPTION OF REPORTS

The Council noted that STACFIS had **adopted** its report with the understanding that some editorial insertions would be made to reflect discussions at its concluding session. The Council accordingly **adopted** the STACFIS report, and then the Scientific Council Report recognizing that the Chairman along with STACFIS Chairman and the Assistant Executive Secretary will undertake the editorial work.

V. ADJOURNMENT

There being no further business, the Chairman thanked the participants, the Chairman of STACFIS and the Secretariat for their able assistance in the conduct of the meeting.

APPENDIX I. REPORT OF STANDING COMMITTEE ON FISHERY SCIENCE (STACFIS)

Chairman: W. B. Brodie Rapporteur: Various

The Committee met at NAFO Headquarters, Dartmouth, Nova Scotia, Canada during 18-21 November 1994, to review the status of the shrimp stocks in Subareas 0 and 1, and Denmark Strait referred to it by the Scientific Council. Representatives attended from Canada, Denmark (in respect of Faroe Islands and Greenland) and Iceland.

I. STOCK ASSESSMENTS

1. Shrimp in Subareas 0 and 1 (SCR Doc. 94/88, 89, 93, 94, 95)

a) Introduction

In accordance with the recommendation of Scientific Council in November 1993, the entire shrimp stock in Div. 0A and Subarea 1, both north and south of 71°N and inshore, is assessed as a single population.

Overall catches in the entire stock area increased until 1986, were stable from 1986 to 1988, then increased until 1992 followed by a decrease in 1993. Preliminary statistics indicate that catches in 1994 will be above the 1993 level.

The nominal catch of shrimp in the offshore areas of Subarea 1 south of 71°N and the adjacent part of Subarea 0 (Div. 0A) increased from less than 1 000 tons before 1972 to almost 43 000 tons in 1976, fluctuated thereafter, stabilized around a level of 44 000 tons during 1985-88, and then increased to about 68 000 tons in 1992 and 1993. Preliminary statistics available for 1994 (January-October) showed total catches of about 52 400 tons (compared to 46 400 tons in the same months in 1993). The fishery has been regulated by TAC since 1977 (Table 1; Fig. 1).

Table 1. Shrimp in Div. 0A and Subarea 1: nominal catches and TAC (tons).

	1984	1985	1986	1987	1988	1989	1990	1991[1]	1992[1]	1993[1]	1994[1]
Div. 0A											
Total[2]	2 142	3 069	2 995	6 095	5 881	7 235	6 177	6 788	7 493	5 491	3 920
SA 1 Offshore											
North of 71°N	-	4 349	11 045	10 700	6 660	2 522	2 121	1 077	2 647	641	378[4]
South of 71°N[3]	33 741	39 547	41 589	40 020	37 559	42 676	52 020	56 264	61 324	62 680	48 505[4]
SA 1 inshore[3]	7 500	7 500	7 500	6 921	10 233	13 224	10 333	11 177	13 412	5 741	4 081[4]
SA 1 Total	41 241	51 396	60 134	57 641	54 452	58 422	64 474	68 518	77 383	69 062	52 964[4]
SA 0+1 Total	43 383	54 465	63 129	63 736	60 333	65 657	70 651	75 306	84 876	74 553	56 884[4]
0+1 offshore catch[5]	35 883	42 616	44 584	46 115	43 440	49 911	58 197	63 052	68 817	68 171	52 425[4]
0+1 advised TAC[5]	29 500	36 000	36 000	36 000	36 000	44 000	50 000	50 000	50 000	50 000	50 000
0+1 effective TAC[5,6,7]	34 925	42 120	40 420	40 120	40 120	45 245	45 245	46 225	44 200	40 600[8]	42 300[8]

[1] Provisional.
[2] Includes information in addition to official statistics.
[3] Revised data for 1990-93.
[4] Preliminary statistics available as of November 1994.
[5] Offshore south of 71°N.
[6] Including TAC in Div. 0A: 1984 - 5 000 tons, 1985-88 - 6 120 tons, 1989-90 - 7 520 tons, 1991-94 - 8 500 tons.
[7] Not including catches from vessels <75 GRT.
[8] SA 1 offshore south of 68°N + Div. 0A.

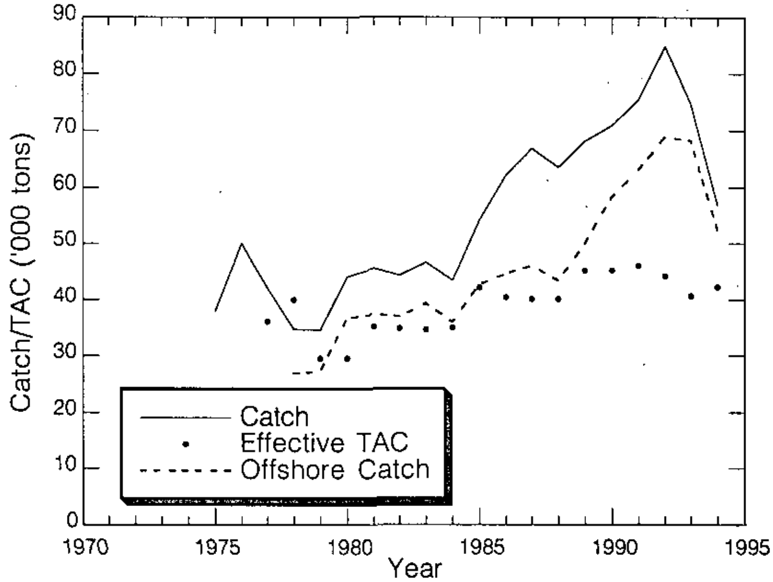

Fig. 1. Shrimp in Subareas 0 and 1: catches and TACs.

During the history of this fishery, the fishing grounds in Div. 1B have been the most important. Since 1987, however, there have been increasing catches in Divisions south of 1B.

The fishery in Div. 0A usually takes place from July to November. In Subarea 1 the fishery occurs in all months of the year, however, early in the year it is often confined to the southern Divisions due to ice coverage in Div. 1A and 1B. In 1994 there was less than normal ice coverage, and the northern Divisions could be accessed earlier than in previous years.

An offshore fishery north of 71°N, outside the fishing areas in Subareas 0 and 1 for which TACs have previously been advised, began in 1985 and yielded about 4 300 tons that year. In 1986 and 1987 catches increased to about 11 000 tons, decreased steadily to about 1 000 tons in 1991, increased to 2 647 tons in 1992 and decreased again in 1993 and 1994 to the lowest figures since the fishery started. This fishery normally occurs from June to November.

Effort by large trawlers in Subarea 1 was lower in 1993 and 1994 compared to earlier years because a significant part of the fleet participated in the shrimp fishery on the Flemish Cap (Div. 3M).

The West Greenland inshore shrimp fishery was relatively stable from 1972 to 1987 with estimated catches of 7 000-8 000 tons annually (except for 10 000 tons in 1974). Catches in recent years have increased to over 13 000 tons in 1992, but decreased in 1993 to less than 6 000 tons due to a shift from inshore to offshore areas of the small vessel fishery (SCR Doc. 94/89). Preliminary data for 1994 (January-September) indicate catches at a slightly higher level than in the same period in 1993.

b) **Input Data**

i) **Commercial fishery**

Fishing effort and CPUE (Fig. 2). Catch and effort data from the shrimp fishery in 1994 were available from fishing records from Canadian vessels in Div. 0A (SCR Doc. 94/88) and from Greenland logbooks for Subarea 1 (SCR Doc. 94/93).

An overall increase in effort by large vessels was observed from 1987 to 1991, followed by a decrease in 1992 and 1993, and remained stable in 1994.

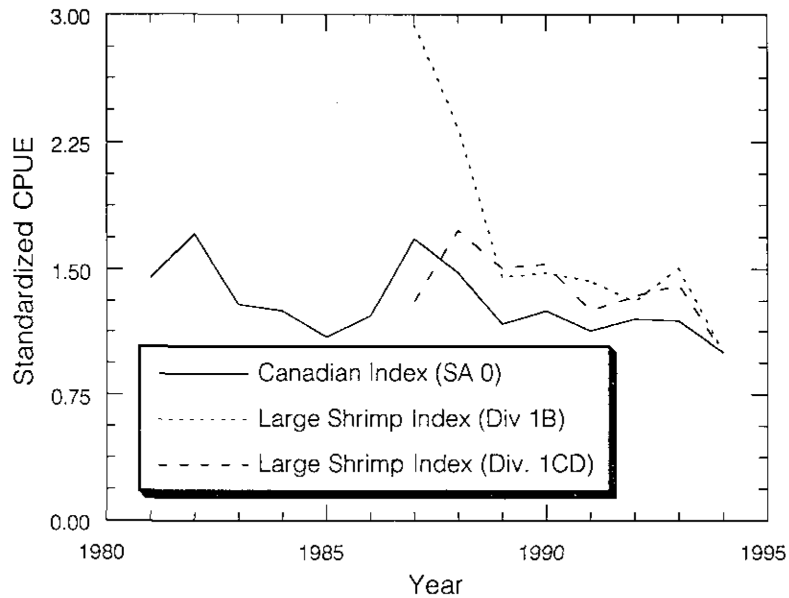

Fig. 2. Shrimp in Subareas 0 and 1: standardized CPUE indices from Div. 0A, Div. 1B and 1CD.

Unstandardized yearly catch rates were calculated using Canadian fishery data from Div. 0A from 1979 to 1994. Because of seasonality in the catch rates and changes in the fleet over time, the data from 1981 to 1994 were analyzed using a multiplicative model to produce standardized yearly catch rates (SCR Doc. 94/88, Table 5). The series showed two periods of stable catch rates (1983-86 and 1989-93), separated by a higher level in 1987-88, and a significant decrease from 1993 to 1994.

From 1987 onward, logbook data from 33 Greenland trawlers, which record the shrimp catch by size category in the logbook, were used in a multiplicative model to establish a CPUE index for large shrimp >8.5 g (mainly females), for which unreported discards were supposedly at a low level (SCR Doc. 94/93, Table 6, Fig. 9). The index in Div. 1B showed a decrease from 1987 to 1989 followed by stability from 1989 to 1992, an increase in 1993, and a significant decrease in 1994. The index in Div. 1CD increased from 1987 to 1988, decreased to 1991, and increased slightly to 1993 followed by a significant decrease in 1994.

Length and age composition. Length frequency distributions obtained by observers were available from the commercial fishery in Div. 0A from 1981 to 1994 (SCR Doc. 94/88, Fig. 7) and in Subarea 1 from 1990 to 1994 (SCR Doc. 94/93, Table 7). The relative importance of the 1985 year-class was evident in 1990 as it recruited to the fishery, and in 1991-93, when it clearly dominated the catches. In 1994 this year-class still accounted for a substantial part of the catches, but it was not possible identify the actual abundance in the group of females.

In 1994, there were proportionally more shrimp below 19 mm carapace length (CL) than in 1993. Three male groups at 18, 20 and 22 mm were identifiable in samples from most areas and seasons. Samples were, however, dominated by males at 22 mm CL (the 1988 year-class), and females at 25-27 mm CL. These two size groups made up more than 75% of the total catches in Div. 0A (SCR Doc. 94/88, Table 7).

Shrimp discards. In Div. 0A, the percentages of shrimp discard estimated by observers declined in recent years from a high of 6.5% in 1991 to 2.5% in 1993 and 1.3% in 1994, the lowest level achieved during the 1981 to 1994 period (SCR Doc. 94/88, Table 11). The further decrease in 1994 was consistent with the domination of catches by year-classes produced before 1989, but also might reflect favourable markets for all sizes of shrimp in 1994.

It was believed that discarding had decreased in Subarea 1 after the introduction of an observer system in 1992.

ii) **Research survey data**

Abundance estimates. Trawl surveys have been conducted from 1988 in offshore and from 1991 in inshore (SCR Doc. 94/94, 95) Subarea 1 and adjacent parts of Division 0A. The trawlable biomass estimates are as follows:

Biomass ('000 tons)	1988	1989	1990	1991	1992	1993	1994
Offshore, south of 71°N	159	184	166	115	165	217	175
Offshore, north of 71°N	13	8	9	4	14	8	3
Inshore (Div. 1A)	-	-	-	48	45	32	41
Total	-	-	-	167	224	257	219

The estimated numbers of shrimp in the total areas surveyed are shown in the following table by sex and year:

No. of shrimp (billions)	1988	1989	1990	1991	1992	1993	1994
Offshore:							
Males (age < 7)	18.1	31.9	21.9	12.2	20.9	31.8	25.0
Females (age 7+)	7.7	6.0	8.0	4.4	5.5	7.9	6.4
Total offshore	25.9	37.8	29.8	16.6	26.5	39.7	31.4
Inshore:							
Males (age < 7)	-	-	-	5.5	5.6	3.2	4.9
Females (age 7+)	-	-	-	2.0	1.6	1.5	1.6
Total inshore	-	-	-	7.4	7.1	4.7	6.6
Total	-	-	-	24.0	33.6	44.4	38.0

Offshore: In July-September 1994, the stratified-random trawl survey was carried out in the main area of shrimp distribution in Div. 1A to 1E and the adjacent part of Div. 0A. The survey was carried out for the first time as a two-phase survey applying more stations into strata with high densities (SCR Doc. 94/95), reducing the 95% confidence interval in 1994 from 68 to 31%.

Total biomass estimate from the 1994 survey was somewhat lower than in 1993, the highest in the survey series, but at the same level as in 1988, 1990, and 1992. In 1993 and 1994, however, the biomass was concentrated in the areas north of Store Hellefiskebanke adjacent to Disko Bay. In 1994 the biomass was more concentrated in depths between 300 and 400 m than in earlier years.

Analysis of the research length frequency data (SCR Doc. 94/95, Fig. 6; SCR Doc. 93/70; 132) showed the predominance of the 1985 year-class in 1989, 1990 and 1991 throughout the offshore area. Recruitment of year-classes of the late-1980s was indicated in 1992, 1993 and 1994 but appeared to be much weaker than the 1985 year-class (see text table below).

In 1994, partial recruitment of younger year-classes (1990, 1991 and 1992) was also indicated but the relative strength of these year-classes could not yet be estimated.

Percents-at-age for male shrimp from the Greenland research survey data are given in the following table and show the strength of the 1985 year-class relative to other cohorts:

Age	1988	1989	1990	1991	1992	1993	1994
1						1.6	1.0
2	2.3	1.4	3.8	1.3	3.4	6.8	5.3
3	4.7	14.5	4.8	5.2	11.8	10.7	9.6
4	19.0	50.1	14.4	14.1	15.1	22.5	26.4
5	39.2	21.9	53.4	18.1	27.1	32.1	27.9
6	34.8	12.1	23.6	61.3	42.7	26.3	29.8
Total	100	100	100	100	100	100	100

Inshore: In August 1994 a stratified-random trawl survey was conducted in the inshore areas in Disko Bay and Vaigat (Div. 1A) (SCR Doc. 94/94). Biomass was estimated at 41 000 tons, an increase compared to the estimate of 32 000 tons in 1993, but lower than the estimates around 46 000 tons in 1991 and 1992, with 95% confidence intervals around 30 to 50%.

The overall size compositions of shrimp from the inshore surveys were similar to those for the offshore in relation to the occurrence of modes. The relative proportion of males and females in the survey in 1994 was similar to that observed in 1993. The overall size distribution still showed the presence of a wide range of male year-classes.

c) **Assessment Results**

In Subarea 1 south of 71°N and the adjacent areas of Div. 0A for which STACFIS had been advising a TAC since 1977, nominal catches had steadily increased (except for 1993) and been above advised levels in many years. Catches exceeded the TAC by about 15% in 1989 and 1990, increasing to more than 35% in 1992 and 1993. In Subarea 1 north of 71°N, no TAC had been advised, but STACFIS advised a cautious approach to this resource as catches in this area had declined rapidly to a low level following a few years of substantial catches. In the inshore areas in Subarea 1 for which no TACs had been advised, catches had been relatively stable until 1987, increased thereafter, but decreased after 1992 due to a shift in effort to offshore areas.

Standardized catch-rate indices from Div. 0A, 1B and 1CD all showed a significant decrease from 1993 to 1994, to the lowest level observed.

Survey results showed relative stability in biomass, except for Subarea 1 north of 71°N, where it fluctuated and in 1994 reached the lowest level observed.

The decline of the catch-rate indices had been in accordance with decreased abundance of females in survey results. The strong 1985 year-class entered the fishery in 1990 and maintained catch rates in the following years but has now essentially passed through the fishery. Catches in 1994 have been comprised primarily of year-classes 1985-1988, but the relative contribution of each cannot be precisely estimated. The 1994 fishery has not been as successful as anticipated, and the recruitment may have been overestimated in 1993. Recruitment is generally difficult to estimate except for very large year-classes such as the 1985 year-class.

Catch rates in 1995 will be largely dependent upon the full recruitment of the 1988 year-class. This year-class is estimated to be substantially smaller than the 1985 year-class.

2. **Shrimp in Denmark Strait** (SCR Doc. 94/90, 91, 92, 96, 97)

a) **Introduction**

The fishery in Denmark Strait started in 1978 and has taken place primarily in the area of Strede Bank and Dohrn Bank as well as on the slopes of Storfjord Deep. The available fishing grounds at any given time depends heavily on the ice conditions. The traditional area extends from approximately 65°N to 67°30'N and between 26°W and 34°W. In 1993, a new fishery started in areas between 60°30'N and 65°N and west of 35°W. Catches in the traditional area increased rapidly to 1980 and remained stable to 1983, increased gradually to 1988 (12 500 tons) and then decreased again to 1993 (Fig. 3). In 1994 the catch was 8 100 tons in the whole area. Catches from the new fishing area were 1 300 and 3 700 tons in 1993 and 1994, respectively.

Recent catches and TACs (tons) are as follows:

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Catch north of 65°N											
eastern side	742	1 794	1 150	1 330	1 424	1 326	281	465[1]	1 750[1]	2 553[1]	1 417[1]
western side	5 989	6 316	9 814	10 848	11 125	9 416	9 994	8 200[1]	5 786[1]	4 003[1]	3 040[1]
Catch south of 65°N											
western side	-	-	-	-	-	-	-	-	-	1 285[1]	3 671[1]
Total	6 731	8 110	10 964	12 178	12 549	10 742	10 275	8 665[1]	7 536[1]	7 841[1]	8 128[1]
Advised TAC	4 200	5 000	-	-	-	10 000	10 000	10 000	8 000	5 000	5 000
Effective TAC western side	5 245	6 090	7 525[2]	7 725[2]	8 725[2]	9 025[2]	14 100	14 500	13 000	9 563	9 563

[1] Provisional.
[2] Not including Greenland fishery north of 66°30'N.

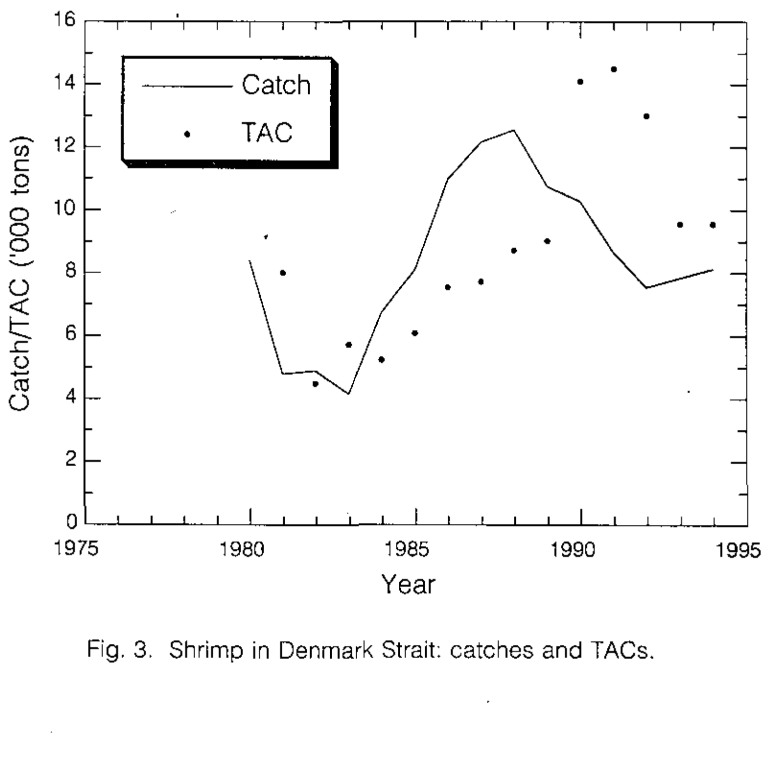

Fig. 3. Shrimp in Denmark Strait: catches and TACs.

b) **Input Data**

i) **Commercial fishery data**

Fishing effort and CPUE. Catch and effort data from logbooks were available from Greenland, Norway, Iceland and EEC-France since 1980, and from Denmark and Faroe Islands since 1986. Although shrimp from the new areas mentioned above are thought to belong to the same stock as those in the traditional area, the catch rates and effort data as shown in the Figures pertain only to the traditional area north of 65°N.

Effort patterns of the three most important fleets (Greenland, Norway and Iceland) were variable in the traditional area. Since 1990 the effort has decreased in both spring (January-June) and autumn (July-December). The Norwegian effort during the spring fishery was variable between 1986 and 1990, but increased substantially in 1991 and 1992, while effort in the autumn fishery increased to 1989, declining thereafter. The overall pattern over the years was quite variable for the Icelandic fishery, switching from an autumn fishery in the 1980s to a spring fishery in the 1990s.

Total unstandardized effort values showed the same pattern as catches. Between 1980 and 1989, effort increased from about 35 000 hours to more than 100 000 hours, declining thereafter to about 72 000 hours in 1993 and further to about 30 000 hours in 1994. The decline in effort was mostly due to the fleet fishing in the new areas. The fishery from July-December became more important at the end of the 1980s, accounting for approximately 50% of the total annual effort, whereas in the 1990s the spring effort has been the most important.

Unstandardized catch-rate series (Fig. 4) fluctuated from 1983 to 1987 followed by a substantial decline to 1989 (SCR Doc. 94/96, Fig. 4 and SCR Doc. 94/92, Table 13). Values for 1990-93 were similar to the low 1989 value at about 50% of the level seen in the early- to mid-1980s. In 1994 there was however a considerable rise in the catch rate.

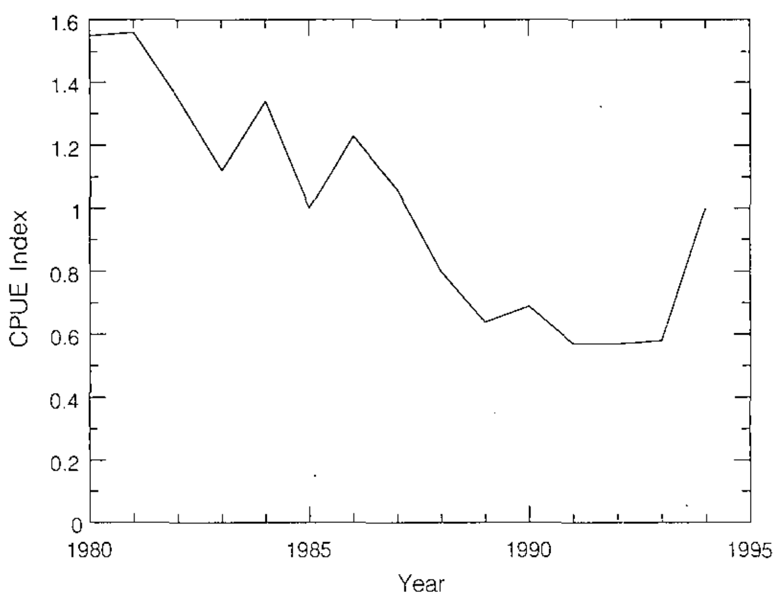

Fig. 4. Shrimp in Denmark Strait: unstandardized catch rates.

Standardized catch-rate series were calculated (Fig. 5) for Greenland for large shrimp and all shrimp. The results for both showed a continuous decline from 1987 to 1992, stability between 1992 and 1993 and a considerable increase in 1994 (SCR Doc. 94/ 91, Fig. 6).

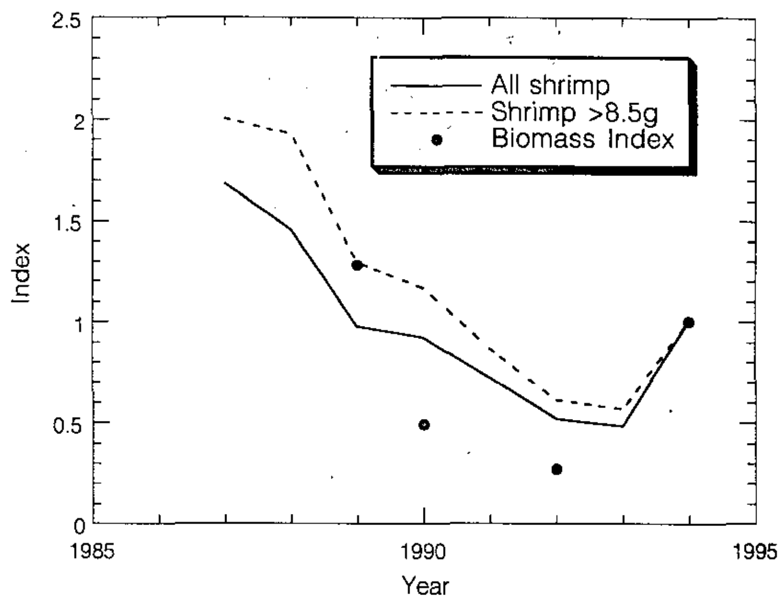

Fig. 5. Shrimp in Denmark Strait: standardized catch rates. Biomass indices from research surveys are shown as points.

Biological data. The Icelandic samples taken in the autumn of 1987 and 1988 showed that the catches in the limited area east of the midline were comprised mainly of female shrimp with a distinct mode at 30-31 mm CL. The 1990 autumn samples showed the increased importance of the male component (about 50% compared to 32 and 26% in 1987 and 1988). The 1991, 1992 and 1993 samples taken in spring showed that male shrimp dominated in all three years. In 1994 the samples taken in spring showed about 50% occurrence of males (SCR Doc. 94/96, Fig. 6). However the more extensive data from the Greenlandic fishery showed that the males comprised only 27% in February (SCR Doc. 94/91, Table 14 and Fig.9).

The occurrence of a component of female shrimp with a mode at 25-26 mm in the 1990 Icelandic samples suggested that sex change occurred earlier than in previous years. The 1991 and 1992 samples showed the occurrence of these small females but there was no noticeable component as seen in the 1990 data. The occurrence of a component of female shrimp with a mode at 25-26 mm as noted in the 1990 samples was again present in 1994 but was not very distinct (SCR Doc. 94/96, Fig 6).

The Greenlandic observer samples (SCR Doc. 94/91, Table 14 and Fig. 9) from the fishery in 1994 in the new areas showed that the occurrence of males ranged from 29% in February to 58% in April. These proportions of males resembled the conditions of the population in the traditional north area in the 1980s.

ii) **Research survey data**

A trawl survey was conducted by Greenland in the Denmark Strait in September-October 1994, based on a new sampling method for this area using a spline technique. The biomass index in 1994 (SCR Doc. 94/90) was much higher than the indices for 1990 and 1992, but lower than the 1989 estimate (Fig. 5).

Greenland survey samples from 1989, 1990, 1992 and 1994 showed an increase in the proportion of males over the period which is consistent with a trend from the 1985 to 1989 Norwegian surveys. The samples also showed a decrease in occurrence of both the largest males and the females between 1989 and the following years.

	Percent males									
	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Norway	43.8	41.4	53.5	58.5	58.0					
Greenland					63.1	62.5	-	78.3	-	74.5

c) **Assessment Results**

Unstandardized catch rates showed a declining trend from 1987 to 1991, a stabilization between 1991 and 1993 and a rise in 1994. The standardized catch rates of the Greenlandic fleet showed also a decline from 1987 to 1992 and a stabilization between 1992 an 1993 followed by about the same increase in catch rate in 1994 as that for all fleets combined. An increase between 1992 and 1994 was also evident in the trawl survey index. Although these indices suggest an increase in abundance, the stock is still considered to be at a lower level than it was during the first half of the 1980s.

Although there were catches taken outside the traditional fishing area in 1993-94, STACFIS concluded that there was no evidence to suggest that they were not part of the same stock. STACFIS noted that the TAC should apply to catches in the whole area, including the new fishery areas.

3. **Other Business**

There being no other business, the Chairman thanked the participants for their work, and the Secretariat for its assistance during the meeting. The meeting adjourned at 1600 hr on 21 November.

PART E

Miscellaneous

CONTENTS

AGENDA. I. SCIENTIFIC COUNCIL SPECIAL MEETING, 13-15 FEBRUARY 1994

I. Opening (Chairman: H. Lassen)

1. Appointment of Rapporteur
2. Adoption of Agenda
3. Work Plan

II. *Fishery Science* (STACFIS Chairman: H. P. Cornus)

1. Stock assessment of cod in Div. 3NO (see Annex 1)
    - catch options for 1994 of cod in Div. 3NO
2. Other matters

III. Adoption of Report

IV. Adjournment

ANNEX 1

The Terms of Reference Presented by Canada Pursuant to Article VII of the NAFO Convention

"Canada has received new and most disturbing research information on the state of the 3NO cod stock. This information is of direct concern to other Contracting Parties, and we wish to bring it to their attention. We also request consideration of this information by the NAFO Scientific Council and by the Fisheries Commission and therefore we propose to add under Part III of the draft agenda [for Special Meeting of Fisheries Commission] an additional item Review of Management Measures in 1994 for Fish Stocks Straddling National Fishing Limits - Cod in Division 3NO.

In order to provide the Fisheries Commission with an updated analysis of the status of the 3NO cod population, I would be grateful if you would request the Chairman of the Scientific Council to call a special meeting of the Scientific Council for February 14 in conjunction with the planned special Fisheries Commission meeting of February 15-17.

We propose the following reference to the NAFO Scientific Council on 3NO cod:

> In June 1993, the Scientific Council reported on 3NO cod that the spawning stock biomass is declining and may not begin to rebuild until the 1989 and later, year-classes begin to make a contribution. A Canadian survey in the spring of 1993 and the 1992 fishery showed some encouraging signs of increased abundance of small fish. However, a more recent survey, completed in December 1993, showed a sharp decline in the biomass estimate from 1992. This information suggests a need to reassess the stock status as quickly as possible before the 1994 fishery, given the very low and declining level of the spawning stock.
>
> The Council is asked to review its response to the Fisheries Commission's request for scientific advice in 1993, in light of the most recent information, and particularly review the question referring to spawning stock levels that might be considered necessary for maintenance of sustained recruitment.
>
> In presenting its analyses, the Council is asked:

- to review present (total and spawning) stock size in relation to historical stock levels, and to levels to be expected in both the short term and the long term under various harvest levels;
- to evaluate the productive potential in relation to these estimated future trends in spawning stock size; and,
- to provide options for rebuilding the spawning stock to the levels seen in the mid-1980s.

Canada has consulted with European Commission officials who concur with this reference to the NAFO Scientific Council as well as with the consideration of the additional question by the Fisheries Commission."

AGENDA II. SCIENTIFIC COUNCIL MEETING, 8-22 JUNE 1994

I. Opening (Chairman: H. Lassen)

1. Appointment of rapporteur
2. Adoption of agenda
3. Attendance of observers
4. Plan of work
5. Report of proxy votes (by Executive Secretary)

II. Fishery Science (STACFIS Chairman: H. P. Cornus)

1. General review of catches and fishing activity in 1993

2. Review of recommendations from 1993 meetings

3. Environmental research (Subcommittee Chairman: M. Stein)

   a) Chairman's report
   b) Invited Lecture (Dr. S. Goddard, Northern Cod Project)
   c) Special Session September 1994
   d) Marine Environmental Data Service (MEDS) Report for 1993
   e) Review of environmental studies in 1993
   f) Overview of environmental conditions in 1993
   g) National representatives
   h) Joint Russian/German data evaluation (ICNAF/NAFO data, status report)
   i) Other matters

4. Stock assessments

   a) Review of assessment methods to be used

   b) Stocks within or partly within the Regulatory Area, as requested by the Fisheries Commission with the concurrence of the Coastal State (Annex 1)(Shrimp in Div. 3M will be undertaken during the Annual Meeting in September 1994.):

      - Cod (Div. 3NO; Div. 3M)
      - Redfish (Div. 3LN; Div. 3M)
      - American plaice (Div. 3LNO; Div. 3M)
      - Witch flounder (Div. 3NO)
      - Yellowtail flounder (Div. 3LNO)
      - Capelin (Div. 3NO)
      - Squid (Subareas 3 and 4)
      - [**Note** also Annex 1, Item 3 concerning cod in Div. 2J+3KL]

   c) Stocks within the 200-mile fishery zone in Subareas 2, 3 and 4, as requested by Canada (Annex 2):

      - Greenland halibut (Subarea 2 and Div. 3KL)
      - Roundnose grenadier (Subareas 2 and 3)
      - Silver hake (Div. 4VWX)
      - [**Note** also Annex 2, Item 3 concerning cod in Div. 2J+3KL]

   d) Stocks within the 200-mile fishery zone in Subarea 1 and at East Greenland as requested by Denmark on behalf of Greenland (Annex 3)(Northern shrimp in Denmark Strait and off East Greenland will be undertaken during a special meeting in November 1994.):

      - Redfish (Subarea 1) (if possible, by species)
      - Other finfish and invertebrates (Subarea 1)

e) Stocks overlapping the fishery zones in Subareas 0 and 1, as requested by Canada and by Denmark on behalf of Greenland (Annexes 2 and 3) (Northern shrimp in Subareas 0 and 1 will be undertaken during a special meeting in November 1994):

- Greenland halibut (Subareas 0 and 1)
- Roundnose grenadier (Subareas 0 and 1)

5. Fisheries Commission requests (see Annex 1 with specific reference to items 4, 5 and 6)

6. Ageing techniques and validation studies

a) Report on methods of ageing silver hake otoliths
b) Reports on the otolith exchanges of American plaice and Greenland halibut
c) Other ageing and validation studies reported

7. Gear and selectivity studies

a) Reports on gear and selectivity studies
b) Proposals for gear and selectivity studies

8. Investigations on the relationship between acoustic biomass estimates and biomass estimates based on other methods

9. Other matters

a) Progress report on the Special Session in 1994; Symposium on "Impact of Anomalous Oceanographic Conditions at the Beginning of the 1990s in the Northwest Atlantic on the Distribution and Behaviour of Marine Life" (co-conveners: E. Buch (Denmark), M. Sinclair (Canada) and M. Stein (EEC-Germany))
b) Progress report on the Special Session in 1995: joint NAFO/ICES Symposium on "The Role of Marine Mammals in the Ecosystem" (co-conveners: J. Sigurjonsson (Iceland) and G. B. Stenson (Canada))
c) Topic for Special Session in 1996.
d) Review of arrangements for conducting stock assessments and documentation of assessments
e) Review of report by the Joint ICES/NAFO working group on harp and hooded seals
f) Other business

III. Research Coordination (STACREC Chairman: C. A. Bishop)

1. Fishery statistics

a) Progress report on Secretariat activities in 1993/94

i) Acquisition of STATLANT 21A for 1993 and of STATLANT reports for recent years
ii) Acquisition of statistical information from other NAFO Standing Committees
iii) Publication of statistical information

b) Deadlines for submission of STATLANT 21A and 21B data

i) Clarification of status of Rule 4.4.

c) Preparation for the CWP 16th Session: review of the logbook and STATLANT 21B forms

i) Report on *Ad hoc* Consultation, La Jolla, California, December 1993
ii) STATLANT data and discrepancies in databases
iii) Proposals for *Ad hoc* Consultations and 16th Session

2. Biological sampling

a) Report on activities in 1993/94
b) Report by National Representatives on sampling conducted

c) Report relative to status of data necessary for assessments (by Designated Experts)
d) Assessment data needs in relation to research in the Regulatory Area

3. Biological surveys

a) Review of survey activities in 1993 (by National Representatives and Designated Experts)
b) Surveys planned for 1994
c) Review of stratification schemes (new stratifications and changes)
d) Coordination of survey (Greenland halibut or other surveys - see Annex 1)

4. Non-traditional fishery resources in the NAFO Area

a) Statistics and sampling
b) Survey data

i) Species encountered in surveys
ii) Feasibility of having set-by-set data on non-traditional species

5. Other matters

a) List of fishing vessels for 1992
b) Tagging activities
c) Update of information on conversion factors
d) Review of SCR and SCS documents not considered by STACFIS
e) Pilot Observer Program
f) Other business

IV. Publications (STACPUB Chairman: W. R. Bowering)

1. Review of STACPUB membership

2. Review of scientific publications since June 1993

3. Production costs and revenues for Scientific Council publications

a) Publication costs and revenues
b) Microfiche project
c) Limiting the number of pages printed at the Secretariat

4. Promotion and distribution of scientific publications

a) Publicity and response regarding the Journal
b) Invitational papers for the Journal

5. Editorial matters regarding scientific publications

a) Editorial activities
b) Progress report of publication on western Atlantic cod
c) Progress report of publication on West Greenland cod
d) Progress review of Journal issue of 1993 Special Session
e) Review of general editorial process
f) Review of Editorial Board

6. Papers for possible publication

a) Procedures for STACPUB review
b) Review of proposals resulting from the 1993 meetings
c) Review of contributions to the 1994 meetings

7. Publication of 10-year environmental perspective

8. Other matters

V. Rules of Procedure

1. Establishment of a Standing Committee on Environment under the Scientific Council in accordance with Rule 5.4.
2. Restructuring the working arrangements of STACFIS and modification of Rule 5.1.

VI. Collaboration with other Organizations

1. Joint ICES/NAFO Working Group on harp and hooded seals (see also Annex 2[1])
2. Sixteenth Session of CWP and proposed *Ad hoc* Consultation

VII. Arrangements for Special Sessions

[See under Fishery Science, Section 9(a), 9(b) and 9(c)]

VIII. Future Scientific Council Meetings, 1994 and 1995

1. Annual Meeting in September 1994 (including assessment of Flemish Cap shrimp)
2. Special Meeting in November 1994 (assessment of Northern Shrimp in Subareas 0+1 and off East Greenland)
3. Other Scientific Council Meetings

IX. Nomination and election of STACFIS Chairman

X. Other Matters

XI. Adoption of Reports

1. Committee reports from this meeting (STACFIS, STACREC, STACPUB)
2. Scientific Council Report, June 1994

XII. Adjournment

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[1] A request was received from Denmark (Greenland) during the Scientific Council Meeting on 17 June 1994, and is given in Annex 4.

ANNEX 1

FISHERIES COMMISSION'S REQUEST FOR SCIENTIFIC ADVICE ON MANAGEMENT IN 1995 OF CERTAIN STOCKS IN SUBAREAS 3 AND 4

1. The Fisheries Commission with the concurrence of the Coastal State as regards the stocks below which occur within its jurisdiction, requests that the Scientific Council, at a meeting in advance of the 1994 Annual Meeting, provide advice on the scientific basis for the management of the following fish and invertebrate stocks or groups of stocks in 1995:

   Cod (Div. 3NO; Div. 3M)
   Redfish (Div. 3LN; Div. 3M)
   American plaice (Div. 3LNO; Div. 3M)
   Witch flounder (Div. 3NO)
   Yellowtail flounder (Div. 3LNO)
   Capelin (Div. 3NO)
   Squid (Subareas 3 and 4)
   Shrimp (Div. 3M)

2. The Commission and the Coastal State request the Scientific Council to consider the following options in assessing and projecting future stock levels for those stocks listed above:

   a) For those stocks subject to analytical dynamic-pool type assessments, the status of the stock should be reviewed and management options evaluated in terms of their implications for fishable stock size in both the short and long term. As general reference points the implications of fishing at $F_{0.1}$, F_{1993} and F_{max} in 1995 and subsequent years should be evaluated. The present stock size and spawning stock size should be described in relation to those observed historically and those expected in the longer term under this range of options.

      Opinions of the Scientific council should be expressed in regard to stock size, spawning stock sizes, recruitment prospects, catch rates and TACs implied by these management strategies for 1995 and the long term. Values of F corresponding to the reference points should be given and their accuracy assessed.

   b) For those stocks subject to general production-type assessments, the time series of data should be updated, the status of the stock should be reviewed and management options evaluated in the way described above to the extent possible. In this case, the general reference points should be the level of fishing effort or fishing mortality (F) which is calculated to be required to take the MSY catch in the long term and two-thirds of that effort level.

   c) For those resources of which only general biological and/or catch data are available, no standard criteria on which to base advice can be established. The evidence of stock status should, however, be weighed against a strategy of optimum yield management and maintenance of stock biomass at levels of about two-thirds of the virgin stock.

   d) Spawning stock biomass levels that might be considered necessary for maintenance of sustained recruitment should be recommended for each stock. In those cases where present spawning stock size is a matter of scientific concern in relation to the continuing productive potential of the stock, management options should be offered that specifically respond to such concerns.

   e) Presentation of the result should include the following:

      i) for stocks for which analytical dynamic-pool type assessments are possible:

         - a graph of yield and fishing mortality for at least the past 10 years.
         - a graph of spawning stock biomass and recruitment levels for at least the past 10 years.
         - a graph of catch options for the year 1995 over a range of fishing mortality rates (F) at least from $F_{0.1}$ to F_{max}.
         - a graph showing spawning stock biomass at 1.1.1996 corresponding to each catch option.

- graphs showing the yield-per-recruit and spawning stock per-recruit values for a range of fishing mortality.

ii) for stocks for which advice is based on general production models, the relevant graph of production on fishing mortality rate or fishing effort.

In all cases the three reference points, actual F, F_{max} and $F_{0.1}$ should be shown.

3. The Fisheries Commission with the concurrence of the Coastal State requests that the Scientific Council continue to provide information, if available, on the stock separation in Div. 2J+3KL and the proportion of the biomass of the cod stock in Div. 3L in the Regulatory Area and a projection if possible of the proportion likely to be available in the Regulatory Area in future years. Information is also requested on the age composition of that portion of the stock occurring in the Regulatory Area.

4. The Scientific Council is asked to review all data available on the implications of using 90 mm minimum mesh size in mid-water trawls when fishing for redfish in Div. 3LN, in comparison to 130 mm. This should include consideration of fish lost during haulbacks.

5. Noting that the Scientific Council has scheduled a Symposium on Seals in the Ecosystem for September 1995, the Fisheries Commission requests a report in 1994 on the nature and extent of analyses that are expected to be tabled at the Symposium with respect to the interrelation between seals and commercial fish stocks.

6. Noting the Scientific Council's recommendations for coordinated research on Greenland halibut, the Fisheries Commission and the two Coastal States emphasize the urgency of acquiring information on the distribution and stock status. The Scientific Council is requested to pursue its coordinated efforts and member countries are urged to commit the necessary resources to the research.

ANNEX 2.

CANADIAN REQUEST FOR SCIENTIFIC ADVICE ON MANAGEMENT IN 1995 OF CERTAIN STOCKS IN SUBAREAS 0 TO 4

1. Canada requests that the Scientific Council, at its meeting in advance of the 1994 Annual Meeting, provide advice on the scientific basis for the management of the following fish and invertebrate stocks in 1995:

   Greenland halibut (Subarea 2 and Div. 3K and 3L)
   Roundnose grenadier (Subareas 2 and 3)
   Silver hake (Div. 4V, 4W and 4X)

   It is also suggested that, subject to the concurrence of Denmark (Greenland), the Scientific Council, prior to the 1994 Annual Meeting of NAFO, provide advice on the scientific basis for management in 1995 of the following stocks:

   Shrimp (Subareas 0 and 1)
   Greenland halibut (Subareas 0 and 1)
   Roundnose grenadier (Subareas 0 and 1)

   The Scientific Council has noted previously there was no biological basis for making two separate assessments for the Greenland halibut throughout Subareas 0-3. The Council is therefore asked, subject to concurrence of Denmark (Greenland) as regards Subarea 1, to provide an overall assessment of the total stock throughout its range and comment on its management, including any expansion of the responses to the questions asked in June 1993.

   With respect to shrimp, it is recognised that the Council may, at its discretion, delay providing advice until later in the year, taking into account data availability, predictive capability, and the logistics of additional meetings.

2. Canada requests the Scientific Council to consider the following options in assessing and projecting future stock levels for those stocks listed above:

   a) For those stocks subject to analytical dynamic-pool type assessments, the status of the stock should be reviewed and implications of continuing to fish at $F_{0.1}$ in 1995 and subsequent years should be evaluated.

The present stock size should be described in relation to those observed historically and those to be expected at the $F_{0.1}$ level in both the short and long term. In those cases where present spawning stock size is a matter of scientific concern in relation to the continuing productive potential of the stock, management options should be considered to rebuild the spawning stock. All results should be expressed in terms of stock sizes, catch rates and TACs implied for 1995 and the long term.

b) For those stocks subject to general production-type assessments, the status of the stock should be reviewed and management options evaluated in the way described above to the extent possible. In this case, the general reference point should be the level of fishing effort (F) which is two-thirds that calculated to be required to take the MSY catch in the long term.

c) For those resources on which only general biological and/or catch data are available, no standard criteria on which to base advice can be established. The evidence on stock status should, however, be weighed against a strategy of optimum yield management and maintenance of stock biomass at levels of about two-thirds that of the virgin stocks.

3. The Scientific Council is requested to review the status of the cod stock in Divisions 2J+3KL and to provide estimates of the current size of the total and spawning biomass, together with a description of recent trends. The Council is asked further to provide estimates of the immediate and long-term outlook for the abundance of this stock, including both total and spawning biomass.

4. With respect to scientific advice on seals, Canada has no specific request at this time. As I noted in my letter to Dr. Chepel dated February 24, 1994, we will have important inputs to the Scientific Council's symposium on "Seals in the Ecosystem" scheduled for September 1995.

B. Rawson
Deputy Minister
Department of Fisheries and Oceans
Ottawa, Canada

ANNEX 3

DENMARK (GREENLAND) REQUEST FOR SCIENTIFIC ADVICE ON MANAGEMENT OF CERTAIN STOCKS IN 1995

1. Denmark, on behalf of Greenland, requests the Scientific Council of NAFO in advance of the 1994 Annual Meeting, provide advice on the scientific basis for management of the following stocks in Subarea 1 in 1995 and as many years forward as data allow:

   i) Redfish (by species, if possible)
   ii) Any other stock of invertebrates and finfish of commercial interest, for which data allow a status report

   It is also suggested that, subject to the concurrence of Canada, advice be given for the following stocks overlapping Subareas 0 and 1:

   i) Greenland halibut
   ii) Roundnose grenadier
   iii) Northern shrimp (*Pandalus borealis*)

   Further, in cooperation with ICES, the Scientific Council is requested to advise on the scientific basis for management of the following stock in the Denmark Strait and off East Greenland:

   i) Northern shrimp (*Pandalus borealis*)

2. In the analyses on which management advice will be based, the following should be included:

   In its 1993 report, the Scientific Council has noted that the offshore component of **Greenland halibut**, in Subareas 0 and 1 was distributed equally between these Subareas, and further that the biomass of the inshore component in Subarea 1 was unknown. The Council is therefore asked to provide information on the following questions asked in June 1993.

a) Analysis of existing information on stock delimitation in Subareas 0, 1, 2 and 3.

b) Allocation of TACs to appropriate Subareas (within Subareas 0 and 1).

c) Allocation of the TAC for Subarea 1 into inshore and offshore areas.

For **Northern shrimp in Subareas 0 and 1** the biological and practical implications of combining all areas of stock distribution for stock assessment purposes should be considered. Specifically, the Council is asked to provide a TAC for areas not included in the 1994 advice (i.e. Subarea 1 north of 71°N and Subarea 1 inshore).

3. The Scientific Council should feel free to report on such other invertebrates and finfish stocks in Subarea 1 and on such other scientifically based management options for the above-mentioned Subarea 1 stocks, as it feels applicable.

Henrik Leth
Aalisarnermut Piniarnermut
Nunalerinermullu Pisortaqarfik
Direktoratet for Fangst, Fiskeri og Landbrug

ANNEX 4.

SCIENTIFIC ADVICE ON SEALS

1. The following request for advice was received on 17 June 1994. This is presented to the Scientific Council with a view to developing terms of reference for a proposed meeting of the ICES/NAFO Working Group.

"Denmark (on behalf of Faroe Islands and Greenland) request advice from the NAFO Scientific Council (eventually via the Joint ICES/NAFO Working Group on Harp and Hooded Seals) on the following issues

Harp and hood seals

- assessment of stock sizes, distribution and pup production of harp and hooded seals in the Northwest Atlantic;

- assessment of sustainable yields at present stock sizes and in the long term under varying options of age composition in the catch;

- advise on catch options in the NAFO area;

- assessment of effects of recent environmental changes or changes in the food supply and possible interaction with other living marine resources in the area.

Einar Lemche
Namminersornerullutik Oqartussat
Gronlands Hjemmestyre
Copenhagen, Denmark"

The Scientific Council advice would be presented to the Fisheries Commission in September 1995. Recognizing the Scientific Council needs to review the Working Group report and prepare its advice, it is hoped the ICES/NAFO Working Group would schedule its meeting for 5-7 June 1995, immediately prior to the Scientific Council meeting.

AGENDA III. SCIENTIFIC COUNCIL MEETING, 19-23 SEPTEMBER 1994

I. Opening (Chairman: H. Lassen)

1. *Appointment of rapporteur*
2. Adoption of agenda
3. Plan of work

II. Fishery Science (STACFIS Chairman: H. P. Cornus)

1. Review of 1994 recommendations

2. Stock assessments

   a) Shrimp in Division 3M (including availability of Div. 3M redfish data) (see note 1 in Attachment 5)
   b) Capelin in Div. 3N and 3O (subject to availability of Russian data)(see note 2)
   c) Data availability for assessment of northern shrimp in November 1994
   d) Greenland halibut fishery with longline *vs* trawl in Div. 0B and Div. 1BCDEF (see Attachment 4)

3. Fisheries Commission requests

   a) Minimum landing sizes for Greenland halibut and flatfishes (see Attachment 1)
   b) Others

4. Arrangements for conducting stock assessments and proposed future documentation

   a) Adoption of work procedures for the June 1995 STACFIS Meeting
   b) Updating list of Designated Experts
   c) Guidelines for Designated Experts
   d) Status of scientific documents
   e) Guidelines for documentation of assessments

5. Future Special Sessions

   a) Report of 15-16 September 1994 Special Session on 'Impact of Anomalous Oceanographic Conditions at the Beginning of the 1990s in the Northwest Atlantic on the Distribution and Behaviour of Marine Life' co-conveners M. Sinclair (Canada) and M. Stein (EU-Germany)
   b) Progress report on September 1995 Special Session (see Attachment 1)
   c) Progress report on September 1996 Special Session
   d) Theme for September 1997 Special Session

6. Other matters

   a) Silver hake ageing methodology report (see note 3)
   b) Other business

III. Research Coordination (STACREC Chairman: C. A. Bishop)

1. Acquisition of STATLANT 21 Data (see note 4)
2. Publication of statistical information (missing data in Statistical Bulletins)
3. Report of CWP *Ad hoc* Consultation of 11-15 July 1994
4. Non-traditional fishery resources in the NAFO Area
5. Data from the Pilot Observer Program (see note 5)
6. Updating of conversion factors (see note 6)
7. Research coordination for Greenland halibut (see note 7)
8. Review of Research Documents (see note 8)
9. Other matters

IV. Publications (STACPUB Chairman: W. R. Bowering)

1. Review of scientific publications

   a) Publications since June 1994 Meeting
   b) Proposals for future publications

2. Promotion and distribution of scientific publications

   a) Invitational papers
   b) Promotion of the Journal

3. Editorial matters

4. Review of papers for possible publication

   a) Consideration of publication of papers from September 1994 Special Session
   b) Papers presented at this meeting
   c) Consideration of papers being presented at November 1994 Shrimp Meeting

5. Other matters

V. Experimental Fisheries

1. Faroese experimental shrimp fishery in Div. 3LN
2. Russian experimental fishing for redfish with different mesh sizes

VI. Rules of Procedure

VII. Structure of Scientific Council and Documentation

1. Adoption of work procedures for June 1995 Scientific Council Meeting (see note 9)
2. Space requirements for June Meeting
3. Hardware and software requirements for June Meeting
4. Documentation and publications of the Scientific Council (see Attachment 2)

VIII. Collaboration with Other Organizations

1. Joint ICES/NAFO Working Group on harp and hooded seals (proposed meeting of 5-7 June 1995) (see Attachment 3 and note 10)
2. Review of proposals at CWP *Ad hoc* Consultations of 11-15 July 1994 on Structure of CWP. (see Note 11)

IX. Review of Future Meeting Arrangements

1. Scientific Council Meeting on northern shrimp 17-20 November 1994
2. June 1995 Meeting of Scientific Council
3. Special Session and Annual Meeting, September 1995
4. June 1996 Meeting of Scientific Council

X. Future Special Sessions

1. Update on Special Session of September 1995 (see Attachment 1)
2. Special Session of September 1996

XI. Other Business

XII. Adoption of Reports

1. Committee Reports of present meeting (STACFIS, STACREC, STACPUB)
2. Report of Scientific Council, September 1994

XIII. Adjournment

ANNOUNCEMENT OF SPECIAL SESSION

The Role of Marine Mammals in the Ecosystem

SYMPOSIUM

Hosted by the Scientific Council
of the Northwest Atlantic Fisheries Organization (NAFO)

and

International Council for the Exploration of the Sea (ICES)

6-8 September 1995
Dartmouth, Nova Scotia, Canada

NAFO and ICES are pleased to announce a Symposium to be held in September 1995, in conjunction with the NAFO 17th Annual Meeting, on the role of marine mammals in the ecosystem. The Symposium will be co-convened by J. Sigurjonsson (Iceland) and G. B. Stenson (Canada) and organized by the NAFO Secretariat. The purpose of this Symposium will be to improve our understanding of the role of marine mammals in the ecosystem through discussion of existing data, ecological models and theoretical developments, and to define future research needs.

Specific topics to be addressed include:

- Theoretical considerations on the ecological role of marine mammals
- Environmental, spatial and temporal aspects of ecological processes of importance to marine mammals
- Foraging strategies
- Energetic considerations in the diet of marine mammals
- Marine mammal - fisheries interactions
- Multispecies models
- Future research requirements

Invited speakers will provide keynote addresses for each of the selected topics. A second announcement and a call letter for contributed papers and posters will be issued by 1 December 1994. A deadline of 1 March 1995 will be set for the provision of abstracts and titles by interested scientists. Papers will be selected on the basis of their relevance to the topics and the time available. Authors will be notified of selected contributions by 30 April 1995 and completed manuscripts will be required at the NAFO Secretariat by 15 August 1995.

Papers presented at the Symposium will be considered for publication by NAFO and ICES.

ATTACHMENT 1

FISHERIES COMMISSION REQUEST

Regarding Minimum Fish Size for Witch, Redfish and G. Halibut, the following discussions developed at the 15th Annual Meeting (extracted from the STACTIC Report):

7. Minimum Sizes for Cod, Yellowtail Flounder and American Plaice - Possible Alternatives to Current Measures (item 9 of the Agenda)

7.1 The Representative of Canada presented a proposal for technical discussions on adding 3 new species to the list - Witch, Redfish and Greenland halibut and three additional columns with their length equivalents.

7.2 The Chairman indicated the Scientific Council would have to be requested to provide information on round length for the three new species proposed but as indicated by some Contracting Parties it would be difficult for the Scientific Council to provide information on product form. Therefore, it **was agreed** that a proposal to the Fisheries Commission would be prepared that the Scientific Council be requested to look at the feasibility and desirability of establishing minimum fish size for the three additional species and to advise on the minimum round length for the three new species proposed in the Canadian paper.

The following response is from Scientific Council Report, 8-22 June 1994, Item 6.d (pages 24-25)

d) **Minimum Landing Sizes for Greenland Halibut and Flatfishes**

The Fisheries Commission requested (FC Doc. 93/18) the Scientific Council to: *review appropriate minimum landing sizes for Greenland halibut and flatfishes.*

The Council noted it had advised on minimum landing sizes for American plaice (25-28 cm) and yellowtail flounder (25-28 cm) in 1992 (NAFO Sci. Coun. Rep., 1992, p. 71).

It was also noted that available data in laboratories have not yet been analyzed and presented to the Scientific Council. The Council agreed to defer its discussions on this subject to its September 1994 meeting.

Fisheries Commission's Request for Scientific Advice on Seals in the Ecosystem

In September 1993 the Fisheries Commission forwarded i.a. the following request to the Scientific Council:

5. Noting that the Scientific Council has scheduled a Symposium on Seals in the Ecosystem for September 1995, the Fisheries Commission requests a report in 1994 on the nature and extent of analyses that are expected to be tabled at the Symposium with respect to the interrelation between seals and commercial fish stocks.

ATTACHMENT 2

PROPOSED PUBLICATIONS RELATED TO THE DOCUMENTATION TO THE SCIENTIFIC COUNCIL STARTING AS OF 1 JANUARY 1995

With regards to the reorganization of the work of the Scientific Council, the following are the publications and the proposed disposition of the documentation related to the Scientific Council, starting as of 1 January 1995.

1. **Journal of Northwest Atlantic Fishery Science** (unchanged, peer reviewed)

   Scientific contributions from individual scientists. Aimed at the general scientific community.

2. **NAFO Scientific Council Studies** (unchanged, limited review)

   Scientific contributions from individual scientists. Aimed at the general scientific community, and more specifically at the fishery scientists working in the Northwest Atlantic.

3. **SCR Document** (no review)

   Scientific contributions from individual scientists including Preliminary Assessments by Designated Experts.

   Documentation relevant to the topics discussed at the Scientific Council meetings and preliminary data and analyses may be considered later in a more complete form for publication in Studies or in the Journal.

4. **SCS Document** (no review)

   a) Statistical updates
   b) National research reports
   c) External committee reports (e.g. CWP, harp and hooded seals)
   d) STACFIS accepted assessments
   e) Internal Reports of the Standing Committees (STACFIS, STACREC, STACFEN and STACPUB)
   f) Scientific Council Reports (each meeting)
   g) Other summary documents (survey plans, ...)

   The papers documenting the STACFIS accepted assessment will be issued as SCS Documents and be made available from the Secretariat upon request.

5. **Statistical Bulletin** (edited by the Assistant Executive Secretary) (unchanged)

   Fisheries statistics

6. **Scientific Council Reports** (issued annually) (will contain all Scientific Council Meeting Reports of each year. These will be issued with the usual red cover).

   a) Requests for advice
   b) Scientific Council Reports
      - Records of Scientific Council meetings including lists of SCR and SCS Documents presented, Agenda and list of participants
      - Annual overview of the fisheries in the Convention Area
      - Annual overview of the environmental conditions in the Convention Area
      - Assessment of fish stocks as requested by the Fisheries Commission and by Contracting Parties
      - Response to other requests from the Fisheries Commission and Contracting Parties
      - Other recommendations

      This report is primarily aimed for the Fisheries Commission and Contracting Parties.

      The format of the assessments as presented in the Scientific Reports should include:

      - Reference to SCS Documents where the accepted assessment can be found
      - Reference to SCR Documents drawn upon for the assessment

Attachment 2. (continued)

- Description of the fishery
- Prognosis and management recommendation
- Summary sheet
- Basic graphs:
  - i) Catch and TAC *vs* year
  - ii) Abundance indices for analytical assessments
  - iii) Recruitment and SSB *vs* year
  - iv) Fishing mortality *vs* year
  - v) Yield and SSB *vs* F for the year of projection
  - vi) Any other graphs deemed essential for understanding the management advice

The accepted STACFIS assessment documents (SCS Doc. mentioned in 4.f above) of a given meeting will be compiled in a single set, with a red cover identifying the set of documents as being the accepted assessments. This package will be issued to participants of the Annual Meeting, and to governments according to an appropriate mail list.

7. **Executive Summary**

Discontinued

8. **Working Papers**

Any information which should be disseminated to Scientific Council and its Committees during session, but which is not relevant for use after the meeting is concluded.

9. **Dumm Documents**

Brightens the life of Scientific Council and Committee members.

ATTACHMENT 3

SCIENTIFIC ADVICE ON SEALS

1. The following request for advice was received on 17 June 1994. This is presented to the Scientific Council with a view to developing terms of reference for a proposed meeting of the ICES/NAFO Working Group.

"Denmark (on behalf of Faroe Islands and Greenland) request advice from the NAFO Scientific Council (eventually via the Joint ICES/NAFO Working Group on Harp and Hooded Seals) on the following issues:

Harp and hood seals

- assessment of stock sizes, distribution and pup production of harp and hooded seals in the Northwest Atlantic;
- assessment of sustainable yields at present stock sizes and in the long term under varying options of age composition in the catch;
- advise on catch options in the NAFO area;
- assessment of effects of recent environmental changes or changes in the food supply and possible interaction with other living marine resources in the area."

Einar Lemche
Namminersornerullutik Oqartussat
Gronlands Hjemmestyre
Copenhagen, Denmark"

ATTACHMENT 4

DENMARK (GREENLAND) REQUEST FOR ADDITIONAL SCIENTIFIC ADVICE ON MANAGEMENT OF GREENLAND HALIBUT IN 1995

The Scientific Council recommends that a TAC for Greenland halibut in Divisions 0B and 1BCDEF be set below 11 000 tons.

Denmark (in respect to Greenland and the Faroe Islands) requests advice from the Scientific Council on a new TAC for this area based on the condition that the TAC will be taken by longlines.

If possible the advice should contain different options corresponding to different ratios between longlining and trawling.

This request is based on the fact that there is a substantial difference in size distribution in the two types of fishery.

Yours sincerely

Einar Lemche

ATTACHMENT 5

SCIENTIFIC COUNCIL

NOTES FROM REPORT OF JUNE 1994 MEETING

Note 1. **By-catch of Redfish in Shrimp Fisheries** (page 32)

The Council expressed *its concern* of the likely negative impact on future recruitment to the redfish fisheries from the discards of small redfish in trawl fisheries for shrimp in Subarea 1 *and in Div. 3M*. In Subarea 1 a dramatic decline of adult redfish (≥ = 16 cm) to an extremely low level has been observed. The Council therefore stressed that this mortality component be included in the assessment of the redfish stocks. This requires that estimates of the magnitude of these by-catches and biological sampling data be made available.

It is important that information on by-catches be provided on numbers and sizes of the redfish as well as weight of the by-catch, whether or not sorting mechanisms are employed, because of the size selectivity of these devices.

With respect to the shrimp fishery in Div. 3M, information on by-catches in the shrimp fishery only up to July 1993 was available. The Council stressed that all information for 1993 be made available when the shrimp resources in this Division will be assessed in September 1994. It was also stressed that the annual information should be made available in advance of the June meeting, when the status of Div. 3M redfish is assessed, because of the relevance of this information to the assessment.

Note 2. **Capelin in Divisions 3N and 3O** (page 95)

A Russian survey is planned for June 1994 and if the results of this survey area available during the September 1994 Meeting, STACFIS **advised** that no capelin fishing be allowed in Div. 3NO during 1995.

Note 3. **Report on Methods of Ageing Silver Hake Otoliths** (pages 98, 99)

In response to the 1991 and 1992 recommendation of the Scientific Council regarding publication of a comprehensive manual on silver hake ageing, STACFIS was informed that the work on the silver hake *radio-nucleotide* study was unsuccessful because of technical reasons. Consequently, the status of the initially proposed report on ageing techniques must now be reviewed *in light* of the lack of results from this study, as well as the change in responsibilities for the Canadian research group conducting ageing studies. The results of this review will be reported to STACFIS at its September 1994 Meeting.

Attachment 5. (continued)

Note 4. **Acquisition of STATLANT 21A and 21B reports for recent years** (page 107)

STACREC was seriously concerned that a major component of NAFO statistics are not available since 1988 from EU-France and **recommended** that *the Scientific Council take steps to obtain these data to complete the database and update statistical bulletins.*

Note 5. **Pilot Observer Program** (page 116)

STACREC noted that this information may be quite useful with regards to stock assessments and **recommended** that *the Scientific Council determine if the data from the Pilot Observer Program can be made available for assessment purposes.*

Note 6. **Update of Information on Conversion Factors** (page 116)

The Secretariat has since been informed that the information is not yet available. The 1993 report of CWP also indicated that the Working Party had made a similar request to FAO. STACREC **recommended** that *further work on conversion factors would not be required at the Scientific Council level until the status of the FAO report was determined.* It also suggested that the Secretariat obtain further information on the progress from FAO.

Note 7. **Coordination of Surveys** (page 115)

Information provided by EU-Spain indicated that they will propose to the EU to conduct a survey (1995) in Div. 3M, 3L, 3N and 3O in depths from 700 to 2 000 m. Greenland with Japan will conduct a survey for Greenland halibut in Subarea 1 during 1994 at depths from 400 to 1 500 m. STACREC **recommended** that *this initiative be discussed and coordinated with other interested countries.*

Note 8. **Other Papers** (page 116)

STACREC tabled for review, eight papers not related to stock assessments, which were traditionally considered in STACFIS (SCR Doc. 94/4, 11, 24, 26, 29, 34, 35, and 38). Sufficient time for adequate review was not available at this particular meeting and STACREC deferred the review to the September 1994 Annual Meeting. STACREC hoped that such reviews in future would be done in June to ensure adequate peer-review.

Note 9. **Review of Recommendations From 1993 Meetings** (page 38)

STACFIS noted the value of the early submission of papers, and this encouraged the Committee to extend the requirements stated in June 1993 (NAFO Sci. Coun. Rep., 1993, p. 43) and **recommended** that *Scientific Council Research Documents (SCR Doc.), excluding assessment papers, and Scientific Council Summary Documents (SCS Doc.) particularly the National Research Reports, in future be submitted to the Secretariat 15 days before the beginning of the Scientific Council Meeting.*

Note 10. **Joint ICES/NAFO Working Group on Harp and Hooded Seals** (page 30)

At the Council meeting on 17 June 1994, the Chairman announced that a request for scientific advice on harp and hooded seals had just been received from Denmark (on behalf of Faroe Islands and Greenland) (see Annex 2). Noting advice would have to be provided by the Council at the Annual Meeting of September 1995, the Scientific Council agreed a request would be forwarded to the ICES/NAFO Working Group on Harp and Hooded Seals to address this request. The Council proposed that this request should be addressed immediately prior to the 7-21 June 1995 Meeting of the Scientific Council. It is hoped the Working Group would schedule its meeting for 5-7 June 1995, in order that some scientists from the Council may attend the meeting.

Note 11. **Structure of the CWP** (page 30)

Further to this Scientific Council request, the Chairman of General Council requested the FAO Coordinator (R. Grainger) of the July 1994 *Ad hoc* Consultation to forward to NAFO, all proposals submitted to that meeting. The Scientific Council deliberations on this matter and any recommendations from the 19-23 September 1994 Meeting will be reviewed by the General Council (see Itemized Memorandum of the General Council Agenda, Item 17 – Other Business).

AGENDA IV. SCIENTIFIC COUNCIL MEETING, 18-21 NOVEMBER 1994

I. Opening (Chairman: H. Lassen*)

1. Appointment of rapporteur
2. Adoption of agenda
3. Plan of work

II. Fishery Science (STACFIS Chairman: W. B. Brodie)

1. Stock assessments (see Annexes 1 and 2)

   - Northern shrimp (Subareas 0 and 1)
   - Northern shrimp (in Denmark Strait and off East Greenland)
   - [**Note**: For Northern shrimp in Subareas 0 and 1, the assessment and TAC advice should include, if possible, the areas north of 71°N in Subarea 1 as well as the inshore region of Subarea 1.]

2. Other business

III. Other Matters

1. Publication of papers on Flemish Cap Shrimp.

IV. Adoption of Reports

V. Adjournment

* Due to the unavailability of H. Lassen (EU-Denmark), Vice-Chairman W. R. Bowering (Canada) was invited to chair this meeting.

ANNEX 1

CANADIAN REQUEST FOR SCIENTIFIC ADVICE ON MANAGEMENT IN 1995 OF CERTAIN STOCKS IN SUBAREAS 0 TO 4

1. Canada requests that the Scientific Council, at its meeting in advance of the 1994 Annual Meeting, provide advice on the scientific basis for the management of the following fish and invertebrate stocks in 1995:

   Greenland halibut (Subarea 2 and Div. 3K and 3L)
   Roundnose grenadier (Subareas 2 and 3)
   Silver hake (Div. 4V, 4W and 4X)

   It is also suggested that, subject to the concurrence of Denmark (Greenland), the Scientific Council, prior to the 1994 Annual Meeting of NAFO, provide advice on the scientific basis for management in 1995 of the following stocks:

   Shrimp (Subareas 0 and 1)
   Greenland halibut (Subareas 0 and 1)
   Roundnose grenadier (Subareas 0 and 1)

   The Scientific Council has noted previously there was no biological basis for making two separate assessments for the Greenland halibut throughout Subareas 0-3. The Council is therefore asked, subject to concurrence of Denmark (Greenland) as regards Subarea 1, to provide an overall assessment of the total stock throughout its range and comment on its management, including any expansion of the responses to the questions asked in June 1993.

   With respect to shrimp, it is recognised that the Council may, at its discretion, delay providing advice until later in the year, taking into account data availability, predictive capability, and the logistics of additional meetings.

2. Canada requests the Scientific Council to consider the following options in assessing and projecting future stock levels for those stocks listed above:

   a) For those stocks subject to analytical dynamic-pool type assessments, the status of the stock should be reviewed and implications of continuing to fish at $F_{0.1}$ in 1995 and subsequent years should be evaluated. The present stock size should be described in relation to those observed historically and those to be expected at the $F_{0.1}$ level in both the short and long term. In those cases where present spawning stock size is a matter of scientific concern in relation to the continuing productive potential of the stock, management options should be considered to rebuild the spawning stock. All results should be expressed in terms of stock sizes, catch rates and TACs implied for 1995 and the long term.

   b) For those stocks subject to general production-type assessments, the status of the stock should be reviewed and management options evaluated in the way described above to the extent possible. In this case, the general reference point should be the level of fishing effort (F) which is two-thirds that calculated to be required to take the MSY catch in the long term.

   c) For those resources on which only general biological and/or catch data are available, no standard criteria on which to base advice can be established. The evidence on stock status should, however, be weighed against a strategy of optimum yield management and maintenance of stock biomass at levels of about two-thirds that of the virgin stocks.

3. The Scientific Council is requested to review the status of the cod stock in Divisions 2J+3KL and to provide estimates of the current size of the total and spawning biomass, together with a description of recent trends. The Council is asked further to provide estimates of the immediate and long-term outlook for the abundance of this stock, including both total and spawning biomass.

4. With respect to scientific advice on seals, Canada has no specific request at this time. As I noted in my letter to Dr. Chepel dated February 24, 1994, we will have important inputs to the Scientific Council's symposium on "Seals in the Ecosystem" scheduled for September 1995.

B. Rawson
Deputy Minister
Department of Fisheries and Oceans
Ottawa, Canada

ANNEX 2

DENMARK (GREENLAND) REQUEST FOR SCIENTIFIC ADVICE ON MANAGEMENT OF CERTAIN STOCKS IN 1995

1. Denmark, on behalf of Greenland, requests the Scientific Council of NAFO in advance of the 1994 Annual Meeting, provide advice on the scientific basis for management of the following stocks in Subarea 1 in 1995 and as many years forward as data allow:

    i) Redfish (by species, if possible)
    ii) Any other stock of invertebrates and finfish of commercial interest, for which data allow a status report

    It is also suggested that, subject to the concurrence of Canada, advice be given for the following stocks overlapping Subareas 0 and 1:

    i) Greenland halibut
    ii) Roundnose grenadier
    iii) Northern shrimp (*Pandalus borealis*)

    Further, in cooperation with ICES, the Scientific Council is requested to advise on the scientific basis for management of the following stock in the Denmark Strait and off East Greenland:

    i) Northern shrimp (*Pandalus borealis*)

2. In the analyses on which management advice will be based, the following should be included:

    In its 1993 report, the Scientific Council has noted that the offshore component of **Greenland halibut**, in Subareas 0 and 1 was distributed equally between these Subareas, and further that the biomass of the inshore component in Subarea 1 was unknown. The Council is therefore asked to provide information on the following questions asked in June 1993.

    a) Analysis of existing information on stock delimitation in Subareas 0, 1, 2 and 3.

    b) Allocation of TACs to appropriate Subareas (within Subareas 0 and 1).

    c) Allocation of the TAC for Subarea 1 into inshore and offshore areas.

    For **Northern shrimp in Subareas 0 and 1** the biological and practical implications of combining all areas of stock distribution for stock assessment purposes should be considered. Specifically, the Council is asked to provide a TAC for areas not included in the 1994 advice (i.e. Subarea 1 north of 71°N and Subarea 1 inshore).

3. The Scientific Council should feel free to report on such other invertebrates and finfish stocks in Subarea 1 and on such other scientifically based management options for the above-mentioned Subarea 1 stocks, as it feels applicable.

Henrik Leth
Aalisarnermut Piniarnermut
Nunalerinermullu Pisortaqarfik
Direktoratet for Fangst, Fiskeri og Landbrug

LIST OF RESEARCH AND SUMMARY DOCUMENTS

RESEARCH DOCUMENTS (SCR)

SCR No.	Ser. #	Author(s) and Title
94/1[a]	N2354	SHELTON, P. A., and M. J. MORGAN. NAFO Divisions 3NO cod stock - spawner stock biomass and recruitment required for replacement. (10 pages)
94/2[a]	N2355	HUTCHINGS, J. A. Temporal variability in estimates of population sustainability for 3NO Atlantic cod from 1959 to 1994. (5 pages)
94/3[a]	N2356	DAVIS, M. B., C. A. BISHOP, D. STANSBURY, and E. F. MURPHY. An assessment of the cod stock in NAFO Divisions 3NO. (51 pages)
94/4[b]	N2360	SIGAEV, I. K. Distribution of silver hake, water temperatures and zooplankton on the Scotian Shelf in May-July 1990. (11 pages + Corrigendum)
94/5[b]	N2361	RIKHTER, V. A. On the problem of the commercial fish populations abundance control in the Northwest Atlantic since 200-miles economic zones enforcement. (7 pages)
94/6[b]	N2362	RÄTZ, H.-J. Redfish Subarea 1 (0-400 m): stock abundance indices, species and length composition, 1982-93. (21 pages)
94/7[b]	N2363	RÄTZ, H.-J. Status of the demersal fish assemblage off West Greenland and a simple production model, 1982-93 (Divisions 1B-1F, 0-400 m). (15 pages)
94/8[b] (Rev.)	N2364	RIKHTER, V. A. On variability of silver hake commercial catches and stocks within the Scotian Shelf before and after the introduction of the 200-mile zone. (5 pages)
94/9[b]	N2367	BECH, G. Biomass and abundance of Greenland halibut (*Reinhardtius hippoglossoides*) and redfish (*Sebastes* spp.) from a bottom trawl survey in NAFO Subarea 1 in 1993. (12 pages)
94/10[b]	N2373	GUNDERSEN, A. C., N.-R. HAREIDE, V. BERG, and S. A. PEDERSEN. A trial longline fishery for Greenland halibut (*Reinhardtius hippoglossoides*) in the Northern Davis Strait, August 1993. (11 pages)
94/11[b]	N2374	MAHÉ, J. C. Median length at 50% maturity of Atlantic cod in Subdivision 3Ps: year to year variations and comparison of samples from Burgeo Bank, St. Pierre Bank and South Slope. (12 pages)
94/12[b] (Rev.)	N2375	KISELEVA, V. M., and A. A. VASKOV. Status of cod stock in NAFO Subarea 3 from 1993 trawl-acoustic survey data. (9 pages)
94/13[b]	N2376	VASKOV, A. A. Assessment of redfish stocks in Divisions 3LN and 3M from trawl-acoustic survey data, 1993. (9 pages)
94/14[b]	N2377	BAKANEV, V. S., and T. M. SERGEEVA. Results of acoustic survey for capelin (*Mallotus villosus*) in NAFO Divisions 3LNO in 1993. (5 pages)

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[a] *Scientific Council Special Meeting, 13-15 February 1994*

[b] Scientific Council Meeting, 8-22 June 1994

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[b] Scientific Council Meeting, 8-22 June 1994

94/33[b]	N2401	DE CÁRDENAS, E., and J. GIL. Geostrophic circulation and cod egg distribution in Flemish Cap. (7 pages)
94/34[b]	N2402	HUNT, J. J., and M. C. BOURBONNAIS. Summary of age training for silver hake. (7 pages)
94/35[b]	N2403	RODRIGUEZ-MARÍN, E., A. PUNZÓN, J. PAZ, and I. OLASO. Feeding of most abundant fish species in Flemish Cap in summer 1993. (33 pages)
94/36[b]	N2404	NARAYANAN, S. Monthly T/S from NE Newfoundland and S. Labrador Shelves. (26 pages)
94/37[b]	N2405	BECH, P. C., E. G. DAWE, and J. DREW. An update of the fishery for short-finned squid (*Illex illecebrosus*) in the Newfoundland area during 1989-93 with descriptions of some biological characteristics and temperature trends. (14 pages)
94/38[b]	N2407	HORSTED, SV. AA. A review with some proposals for amendments of the catch statistics for the cod fisheries in Greenland waters since 1911. (33 pages)
94/39[b] (Rev.)	N2409	HALLIDAY, R. G. Year-class strength in the Scotian Shelf silver hake stock. (8 pages)
94/40[b]	N2410	BISHOP, C. A., J. ANDERSON, E. DALLEY, M. B. DAVIS, E. F. MURPHY, G. A. ROSE, D. E. STANSBURY, C. TAGGART, G. WINTERS, and D. METHVEN. An assessment of the cod stock in NAFO Divisions 2J+3KL. (50 pages)
94/41[b]	N2411	MURPHY, E. F., and C. A. BISHOP. Cod in Divisions 2J+3KL - estimates of biomass and age composition for the portion of the stock in the NAFO Regulatory Area for Canadian research vessels surveys. (9 pages)
94/42[b]	N2412	JØRGENSEN, O., and J. BOJE. Sexual maturity of Greenland halibut in NAFO Subarea 1. (17 pages)
94/43[b] (Rev.)	N2413	BISHOP, C. A. Revisions and additions to stratification schemes used during research vessel surveys in NAFO Subareas 2 and 3. (23 pages)
94/44[b]	N2414	BRODIE, W. B., S. J. WALSH, D. POWER, and M. J. MORGAN. An assessment of the yellowtail flounder stock in Divisions 3LNO. (40 pages)
94/45[b]	N2415	DE CÁRDENAS, E., and M. L. GODINHO. An assessment of American plaice stock in Division 3M (1994). (7 pages)
94/46[b]	N2416	BRODIE, W. B., and S. J. WALSH. Changes in distribution of yellowtail flounder on the Grand Bank during the late-1980s and early-1990s. (16 pages)
94/47[b]	N2417	ATKINSON, D. B., W. R. BOWERING, and W. BRODIE. Analysis of data collected by observers during the Greenland halibut otter trawl fisheries in Subarea 0 during 1988-1993. (10 pages)
94/48[b]	N2419	ATKINSON; D. B., D. POWER, and J. MORGAN. Roundnose grenadier (*Coryphaenoides rupestris*) and roughhead grenadier (*Macrourus berglax*) in NAFO Subareas 2+3. (11 pages)
94/49[b]	N2420	BOWERING, W. R., D. POWER, and W. B. BRODIE. Stock status of witch flounder in NAFO Divisions 3NO. (15 pages)

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94/50[b]	N2421	MYERS, R. A., and N. G. CADIGAN. Correlated error model results for 2J3KL cod in 1993. (9 pages)
94/51[b]	N2422	MYERS, R. A., and N. G. CADIGAN. The statistical analysis of catch-at-age data with correlated errors. (16 pages)
94/52[b]	N2423	MYERS, R. A., and N. G. CADIGAN. Was an increase in natural mortality responsible for the collapse of northern cod? (24 pages)
94/53[b]	N2424	MORGAN, M. J., W. R. BOWERING, and W. B. BRODIE. A comparison of results from Canadian deepwater surveys in 1991 and 1994, with emphasis on Greenland halibut. (18 pages)
94/54[b]	N2425	POWER, D. The status of the Division 3LN redfish resource. (36 pages)
94/55[b]	N2426	BRODIE, W. B., M. J. MORGAN, and D. POWER. An assessment of the American plaice stock in Divisions 3LNO. (43 pages)
94/56[b]	N2427	WALSH, S. J. Distribution, abundance and biomass of juvenile and adult American plaice populations on the Grands Banks, NAFO Divisions 3LNO. (17 pages)
94/57[b]	N2428	BOWERING, W. R., W. B. BRODIE, D. POWER, M. J. MORGAN. Greenland halibut in NAFO Subarea 2 and Divisions 3KLM: a rapidly declining resource with a rapidly increasing fishery. (25 pages)
94/58[b]	N2429	MYERS, R. A. Analysis of mortality from research vessel surveys for cod and flatfish in the Northwest Atlantic. (33 pages)
94/59[b]	N2430	BOJE, J., O. A. JORGENSEN and G. BECH. An assessment of the Greenland halibut stock component in NAFO Subareas 0+1. (13 pages)
94/60[b]	N2431	GORCHINSKY, K., and D. POWER. An assessment of the redfish stock in NAFO Division 3M. (8 pages)
94/61[b]	N2432	LASSEN, H. The catch-trawlable biomass model used in assessment of the American plaice in Division 3M. (3 pages)
94/62[b]	N2433	VAZQUEZ, A. An assessment of the cod stock in NAFO Division 3M. (5 pages)
94/63[c]	N2437	SIGAEV, I. K. Ecological conditions of silver hake concentration on the Scotian Shelf area. (21 pages)
94/64[c]	N2438	DE CÁRDENAS, E. Some considerations about annual growth rate variations in cod stocks. (11 pages)
94/65[c]	N2439	IGLESIAS, S., E. DE CÁRDENAS, and J. PAZ. Presence of American plaice (*Hippoglossoides platessoides*) at non-habitual depths in the Northwest Atlantic. (6 pages)
94/66[c]	N2440	SIGAEV, I. K., and V. A. RIKHTER. On relation of some commercial fish species year-classes abundance and hydrological conditions in the Northwest Atlantic. (6 pages)

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[b] Scientific Council Meeting, 8-22 June 1994
[c] Scientific Council Annual Meeting, 19-23 September 1994

94/67[c]	N2445	STEIN, M., and J. LLORT. Stability of water masses – impact on cod recruitment off West Greenland? (13 pages)
94/68[c]	N2446	FRANK, K. T., J. SIMON and J. E. CARSCADDEN. Recent excursions of capelin (*Mallotus villosus*) to Scotian Shelf and Flemish Cap during anomalous hydrographic conditions. (19 pages)
94/69[c]	N2447	MALMBERG, Sv. Aa., H. VALDIMARSSON and J. MORTENSEN. Long-time series in Icelandic waters in relation to physical variability in the northern North Atlantic. (15 pages)
94/70[c] (Rev.)	N2449	STEIN, M. Environmental Overview in the Northern Atlantic Area – with emphasis on Greenland. (17 pages)
94/71[c]	N2450	DRINKWATER, K. F. Climate and oceanographic variability in the Northwest Atlantic during the 1980s and early-1990s. (39 pages)
94/72[c]	N2451	MANNING, J. Oceanographic conditions of Georges Bank spawning grounds, 1992-1994. (23 pages)
94/73[c]	N2452	SINCLAIR, A. Recent declines in cod stocks in the Northwest Atlantic. (17 pages)
94/74[c]	N2453	NAKASHIMA, B. S. The relationship between oceanographic conditions in the 1990s and changes in spawning behaviour, growth and early life history of capelin (*Mallotus villosus*). (18 pages)
94/75[c]	N2454	NICOLAJSEN, Á. Scientific design of the investigation on board Faroese commercial shrimp vessels in NAFO Divisions 3L and 3M. (1 page)
94/76[c]	N2455	NICOLAJSEN, Á. Age structure of northern shrimp in Division 3M in September-November 1993 and in Division 3L in March 1994. (9 pages)
94/77[c]	N2456	NICOLAJSEN, Á. Growth and reproduction in northern shrimp on Flemish Cap (Division 3M) and the Nose of the Bank (Division 3L) in September 1993-May 1994. (15 pages)
94/78[c]	N2457	NICOLAJSEN, Á. Assessment of the northern shrimp stock on Flemish Cap (Division 3M) (7 pages)
94/79[c]	N2458	NICOLAJSEN, Á. By-catch in shrimp catches using sorting grade: (2 pages)
94/80[c]	N2459	CASAS, J. M. Age structure of roughhead grenadier (*Macrourus berglax*) on Flemish Cap, 1994. (5 pages)
94/81[c]	N2460	SAINZA, C. Northern shrimp (*Pandalus borealis*) on Flemish Cap in July 1994. (6 pages)
94/82[c]	N2461	PARSONS, D. G. Preliminary assessment of shrimp (*Pandalus borealis*) in Division 3M (Flemish Cap). (10 pages)
94/83[c]	N2462	PARSONS, D. G., and P. J. VEITCH. The Canadian fishery for northern shrimp (*Pandalus borealis*) on Flemish Cap (NAFO Division 3M) in 1993 and 1994. (9 pages)
94/84[c]	N2463	GASJUKOV, P. S. On stability of cod stock estimates in NAFO Area 2J3KL. (21 pages)

[c] Scientific Council Annual Meeting, 19-23 September 1994

94/85[c]	N2465	SKÚLADÓTTIR, U. The Icelandic shrimp (*Pandalus borealis*) fishery at the Flemish Cap in 1994. (10 pages)
94/86[c]	N2466	SIEGSTAD, H. The Greenland fishery for northern shrimp (*Pandalus borealis*) on Flemish Cap, 1993 and 1994. (13 pages)
94/87[b]	N2470	DAVIS, M. B., C. A. BISHOP, D. E. STANSBURY, and E. F. MURPHY. Update of the assessment of the cod stock in NAFO Divisions 3NO. (13 pages)
94/88[d]	N2475	PARSONS, D. G., and P. J. VEITCH. The Canadian fishery for northern shrimp (*Pandalus borealis*) in Davis Strait, 1979-1994. (18 pages)
94/89[d]	N2476	ANDERSEN, M. The small vessel shrimp fishery in West Greenland. (6 pages)
94/90[d]	N2477	ANDERSEN, M., D. M. CARLSSON, and P. KANNEWORFF. Trawl survey for shrimp (*Pandalus borealis*) in Denmark Strait, 1994. (11 pages)
94/91[d]	N2478	SIEGSTAD, H., and D. M. CARLSSON. The commercial shrimp fishery in Denmark Strait in 1993 and January-October 1994. (34 pages)
94/92[d]	N2479	SKÚLADÓTTIR, U. The catch statistics of the shrimp fishery (*Pandalus borealis*) in the Denmark Strait in the years 1980-1994. (17 pages)
94/93[d]	N2480	SIEGSTAD, H., and D. M. CARLSSON. The shrimp fishery in NAFO Subarea 1 in 1993 and January-October 1994. (45 pages)
94/94[d]	N2481	ANDERSEN, M., D. M. CARLSSON, and P. KANNEWORFF. Stratified-random trawl survey for shrimp (*Pandalus borealis*) in Disko Bay, West Greenland, 1994. (10 pages)
94/95[d]	N2482	ANDERSEN, M., D. M. CARLSSON, and P. KANNEWORFF. Offshore trawl survey for shrimp (*Pandalus borealis*) in NAFO Subareas 0 and 1, in 1994. (20 pages)
94/96[d]	N2483	SKÚLADÓTTIR, U., M. ANDERSEN, D. M. CARLSSON, P. KANNEWORFF, and H. SIEGSTAD. Preliminary assessment of shrimp in the Denmark Strait. (12 pages)
94/97[d]	N2486	SKÚLADÓTTIR, U. The Icelandic shrimp fishery (*Pandalus borealis*) in the Denmark Strait in 1992-1994, and a preliminary estimation of age. (10 pages)

SUMMARY DOCUMENTS (SCS)

SCS No.	Ser. #	Author(s) and Title
94/1[b]	N2351	NAFO SECRETARIAT. Historical catches of selected species by stock area and country for the period 1982-92. (26 pages)
94/2[a]	N2352	NAFO. Report of Scientific Council, Special Meeting, 13-15 February 1994. (23 pages)
94/3[b]	N2353	V. A. RIKHTER, I. K. SIGAEV, V. BOROVKOV, K. GORCHINSKY, S. KOVALEV and P. SAVVATIMSKY. Russian national research report, 1993. (14 pages)

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[a] Scientific Council Special Meeting, 13-15 February 1994
[b] Scientific Council Meeting, 8-22 June 1994
[c] Scientific Council Annual Meeting, 19-23 September 1994
[d] Scientific Council Meeting, 18-21 November 1994

94/4[b]	N2365	RAWSON, B. Canadian request for scientific advice on management in 1995 of certain stocks in Subareas 0 to 4. (2 pages)
94/5[b]	N2366	LETH, H. Denmark (Greenland) request for scientific advice on management of certain stocks in 1995. (1 page)
94/6[b]	N2368	NAFO SECRETARIAT. Provisional Index and List of Titles of Research and Summary Documents of 1993. (31 pages)
94/7[b]	N2370	NAFO SECRETARIAT. Tagging activities reported for the Northwest Atlantic in 1993. (3 pages)
94/8[b]	N2371	NAFO SECRETARIAT. List of biological sampling data for 1992. (27 pages)
94/9[b]	N2372	NAFO SECRETARIAT. Notes on statistical activities and publications since June 1993. (2 pages)
94/10[b]	N2378	BOUDREAU, P., M. M. ROBERGE, S. HURTUBISE and J.-D. LAMBERT. Canadian research report for 1993. (24 pages)
94/11[b]	N2379	CORNUS, P., H.-J. RÄTZ, and M. STEIN. German research reports for 1993. (4 pages)
94/12[b]	N2386	SERCHUK, F. M., and M. D. GROSSLEIN. United States research report for 1993. (7 pages)
94/13[b]	N2397	ALPOIM, R., A. M. AVILA DE MELO, M. L. GODINHO, and E. SANTOS. Portuguese research report for 1993. (49 pages)
94/14[b]	N2398	YOKAWA, K. Japanese research report for 1993. (3 pages)
94/15[b]	N2406	ANDERSEN, M. Denmark/Greenland research report for 1993. (6 pages)
94/16[b]	N2408	VAZQUEZ, A., S. JUNQUERA, J. PAZ, and L. MOTOS. Spanish research report for 1993. (13 pages)
94/17[b]	N2418	LASSEN, H. Changes to Rule of Procedure for the Scientific Council. (2 pages)
94/18[b]	N2434	NAFO SECRETARIAT. A compilation of research vessel surveys on a stock-by-stock basis. (19 pages)
94/19[b]	N2435	NAFO. Report of Scientific Council, 8-22 June 1994 Meeting. (134 pages)
94/20[c]	N2467	NAFO SECRETARIAT. Report of *Ad hoc* Inter-agency Consultation on Atlantic Fishery Statistics, Madrid, 11-15 July 1994. (17 pages)
94/21[c]	N2468	NAFO. Report of Scientific Council, 19-23 September 1994 Meeting. (46 pages)
94/22[c]	N2469	NAFO SECRETARIAT. Reports of the Coordinating Working Party on Atlantic Fishery Statistics (CWP). (2 pages)
94/23[d]	N2484	NAFO. Report of Scientific Council, 18-21 November 1994 Meeting. (23 pages)
94/24[d]	N2487	NAFO SECRETARIAT. Provisional nominal catches in the Northwest Atlantic, 1993. (44 pages)
94/25[d]	N2488	NAFO SECRETARIAT. General fishery trends for the Northwest Atlantic in 1993. (3 pages)

[b] Scientific Council Meeting, 8-22 June 1994
[c] Scientific Council Annual Meeting, 19-23 September 1994
[d] Scientific Council Meeting, 18-21 November 1994

LIST OF PARTICIPANTS IN SCIENTIFIC COUNCIL MEETINGS, 1994

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		Meetings
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Colbourne, E.B.	" " " " " " "	B
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Murphy, E.F.	" " " " " " "	B
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Parsons, D.G.	" " " " " " "	C D
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Stansbury, D.E.	" " " " " " "	B
Stenson, G.B.	" " " " " " "	C
Veitch, P.J.	" " " " " " "	C
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Showell, M.A.	" " " " " "	B C
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CUBA

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A = Scientific Council Special Meeting, 13-15 February 1994
B = Scientific Council Meeting, 8-22 June 1994
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D = Scientific Council Meeting, 18-21 November 1994

		Meetings

DENMARK

GREENLAND

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Jørgensen, O.A.	" " " " " " "	B
Kanneworff, P.	" " " " " " "	D
Pedersen, S.A.	" " " " " " "	C
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A = Scientific Council Special Meeting, 13-15 February 1994
B = Scientific Council Meeting, 8-22 June 1994
C = Scientific Council Annual Meeting, 19-23 September 1994
D = Scientific Council Meeting, 18-21 November 1994

		Meetings
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		Meetings

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T. Amaratunga, Assistant Executive Secretary
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D. C. A. Auby, Clerk-Secretary
F. E. Perry, Desktop Publishing/Documents Clerk
R. A. Myers, Graphic Arts/Printing Technician
B. T. Crawford, Graphic Arts/Printing Technician
G. M. Moulton, Senior Statistical Officer
C. L. Kerr, Statistical Clerk
B. L. Marshall, Statistical Clerk

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N.B. The list of participants of the 15-16 September 1994 Symposium is appended to the Report of the Symposium.

LIST OF RECOMMENDATIONS IN 1994

PART A

Special Meeting, 13-15 February 1994

STACFIS

Stock Assessments

Cod in Divisions 3NO

Prognosis

The determination of present and past stock levels is greatly influenced by the option of PR adopted. This issue could not be resolved at this meeting. STACFIS **recommended** that *the estimation of partial recruitment be addressed before the next assessment to include analysis to determine the most appropriate approach for determination of partial recruitment.*

PART B

Scientific Council Meeting, 8-22 June 1994

SCIENTIFIC COUNCIL

Preparation for CWP 16th Session

The Council noted that the Assistant Executive Secretary would not attend the July meeting but reconfirmed that attendees (STACREC Chairman, C.A.Bishop; Assistant Executive Secretary, T. Amaratunga, and the representative from Spain, E. de Cardenas) slated to attend the Sixteenth Session of CWP will be **recommended** to attend that meeting, now scheduled for February 1995 in Madrid, Spain.

Other Matters (page 48)

The Council endorsed the **recommendation** that the Secretariat request documentation detailing any revisions of conversion factors used in STATLANT Area 21.

The Council was informed of the extension of the Pilot Observer Program, and endorsed the STACREC **recommendation** that it be determined if data from this program can be made available in time for annual June assessment meeting of the Council.

Sixteenth Session of CWP and Proposed *Ad Hoc* Consultation (page 50)

The Council noted the Sixteenth Session of the CWP had been postponed to early-1995 in Madrid, Spain, and reconfirmed that representatives of the Scientific Council **recommended** during the September 1993 Meeting viz. STACREC Chairman, C. A. Bishop (Canada), Assistant Executive Secretary, T. Amaratunga, and the representative from Spain, E. de Cardenas, would attend the Sixteenth Session.

STACFIS

II. REVIEW OF RECOMMENDATIONS FROM 1993 MEETINGS (pages 57 and 58)

An improvement was reported on the early provision of assessment-related data to the Designated Experts compared to 1993. However, it was not considered to be sufficient to meet the requirements of Designated Experts. Therefore, STACFIS emphasized the importance of availability of data and again **recommended** that *for the future, national representatives, at the same time as endeavouring to make all necessary data relevant to the assessments available* *to Designated Experts by May 15 (NAFO Sci. Coun. Rep., 1991, p. 44), should also attempt to provide as much catch/effort data (including preliminary data) as are available.*

STACFIS reiterated the **recommendation** that *in future, numbers (e.g. abundance/biomass) derived from research surveys be accompanied by estimates of variance associated with these.*

STACFIS noted the value of the early submission of papers, and this encouraged the Committee to extend the requirements stated in June 1993 (NAFO Sci. Coun. Rep., 1993, p. 43) and **recommended** that *Scientific Council Research Documents (SCR Doc.), excluding assessment papers, and Scientific Council Summary Documents (SCS Doc.) particularly the National Research Reports, in future be submitted to the Secretariat 15 days before the beginning of the Scientific Council Meeting.*

STOCK ASSESSMENTS

Redfish in Division 3M

Prognosis (page 75)

Based on this information, STACFIS **recommended** that *the total catch for redfish in Div. 3M be reduced to 20 000 tons for 1995.* This amount of catch is in the range of catch levels from 1975 to 1985, when stable conditions had been observed in the fishery.

Redfish in Divisions 3LN

Prognosis (page 78)

STACFIS considers this resource to be at a low level and that no improvement could be expected as long as catches exceed recommended TACs. STACFIS therefore **recommended** that *for redfish in Div. 3LN catches be reduced and the total catch not exceed 14 000 tons.*

Future Studies (page 78)

STACFIS considered this issue important and necessary to resolve, accordingly, **recommended** that *(1) existing data be examined to evaluate the appropriateness of Div. 3LN and Div. 3O management units for redfish*, and (2) *further examination be conducted of the Russian trawl-acoustic survey data to provide more detail on the location of concentrations of redfish both near the bottom and in the water column in Div. 3LNO.*

American plaice in Division 3M

Prognosis (page 85)

It is believed that this decline was due to excessive fishing mortality at least in the period 1988-91. In order to halt the decline of the stock, STACFIS **recommended** that *the catch of American plaice in Div. 3M should not exceed 1 000 tons in 1995.* This corresponds to the expected by-catches in non-directed fisheries.

American plaice in Divisions 3LNO

Research survey data (page 90)

STACFIS recognized the importance of the Russian spring survey data in providing an index of abundance for this stock and **recommended** that *the estimates from the 1993 and 1994 USSR/Russian surveys be made available in June 1995 if possible.*

Yellowtail flounder in Divisions 3LNO

Research survey data (page 96)

STACFIS recognized the importance of the Russian survey data in providing an index of abundance for this stock and **recommended** that *the estimates from the 1993 and 1994 USSR/Russian groundfish surveys be presented in June 1995, if possible.*

Greenland halibut in Subarea 2 and Divisions 3K and 3L

Biological studies (page 107 and 108)

It was agreed that these types of studies are essential as the reproductive strategy of this species is very unclear but yet critically important in making appropriate decisions on harvesting strategy, and as such STACFIS **recommended** that *collection of maturity samples from deepwater fisheries on Greenland halibut be encouraged.*

VIII. RELATIONSHIPS BETWEEN ACOUSTIC BIOMASS ESTIMATES AND OTHER METHODS (page 119)

Concerning surveys combining estimates from trawl fishery and estimation from acoustic measurements, STACFIS **recommended** that:

1. *Information be provided to compare size distributions from the trawl component and the pelagic component at the same stations, and more detailed information be presented describing the vertical and horizontal distribution as determined from the trawl-acoustic surveys, and*

2. *further examination be conducted of trawl acoustic survey data to provide more details on the location or concentration of fish species, both near the bottom and in the water column, in all areas in which combined trawl acoustic surveys are carried out.*

STACREC

Fishery Statistics

Acquisition of STATLANT 21A and 21B reports for recent years (page 127)

STACREC was seriously concerned that a major component of NAFO statistics were not available since 1988 from EU-France and **recommended** that *the Scientific Council take steps to obtain these data to complete the database and update statistical bulletins.*

Biological Surveys

Coordination of Surveys (page 136)

Greenland with Japan will conduct a survey for Greenland halibut in Subarea 1 during 1994 at depths from 400 to 1 500 m. STACREC **recommended** that *this initiative be discussed and coordinated with other interested countries.*

Other Matters

Update of Information on Conversion Factors (page 136)

STACREC **recommended** that *further work on conversion factors would not be required at the Scientific Council level until the status of the FAO report was determined.* It also suggested that the Secretariat obtain further information on the progress from FAO.

Pilot Observer Program (page 137)

Contracting Parties, through STACTIC, set up a Pilot Observer Program in 1993 which has been extended into 1994. Information from this program has not been made available to STACREC for review. STACREC noted that this information may be quite useful with regards to stock assessments and **recommended** that *the Scientific Council determine if the data from the Pilot Observer Program can be made available for assessment purposes.*

PART C

Scientific Council Annual Meeting, 9-23 September 1994

STACFIS

STOCK ASSESSMENTS

Shrimp in Division 3M

By-catch of redfish (page 147)

By-catch of redfish will continue to be a problem in 1995. Grates with 28 mm bar spacings eliminate virtually all by-catch of redfish >21 cm. The Council **recommended** that *the mandatory use of grates in shrimp fishing activities on Flemish Cap be continued but that a bar spacing of less than 28 mm be enforced.*

STACREC

Non-traditional Fishery Resources in the NAFO Area (page 170)

Information concerning distribution and abundance of such species as skates and wolffish can be found in many of the research survey databases held by Contracting Parties and STACREC **recommended** that *efforts be made to analyse data on distribution and abundance of non-traditional species such as skates and wolffish contained in research survey databases held by Contracting Parties, and present the results of these analyses during the June, 1995 meeting.*

STACPUB

Journal of Northwest Atlantic Fishery Science (page 175)

Noting the importance of completing this publication as soon as possible, STACPUB **recommended** that *conveners of the 1993 symposium be requested to inform STACPUB on the anticipated time of completion.*

Consideration of Publication of Papers from September 1994 Special Session (page 176)

STACPUB **recommended** that *a discussion be initiated during the June 1995 meeting to consider a publication series similar to ICNAF Special Publication Series to provide a collated volume of Symposium contributions.*

Papers Presented at This Meeting (page 176)

There being a considerable number of current publications on shrimp on Flemish Cap where a new fishery has developed, STACPUB **recommended** that *during the Scientific Council Meeting on northern shrimp in November 1994, the views of the authors should be solicited with respect to a possible single publication of papers on shrimp on Flemish Cap.*